School of Computer science

A tool for using the control of character animation to help teach children communication skills

Liangzhong Ying, MSc.

Thesis submitted to the University of Nottingham for the degree of Doctor of Philosophy

April 2012

Abstract

Effective Communication is an integral part of everyday life but recent studies show that in the UK many children fail to obtain this essential skill. The traditional approach to teaching communication skills is still important in school but new developments and the increasing availability of technology in the classroom, offer the potential for new ways to approach this teaching. A number of research institutions in the UK, for example the British Film Institute, are investigating how to use media such as films and television, in the classroom, in order to enhance children's learning. Making cartoon films is a potentially valuable teaching approach but the lack of a suitable software tool to support this aspiration limits its viability. Existing software tools do reference the learning of communication skills as one of their features but they do not see this as a major learning objective.

The aim of this thesis is to investigate three hypotheses based around the concept of using cartoon animation as a tool to enhance learning of communication. The first of these is that film production software which gives children control of character animation design may significantly stimulate their interest in exploring how to express their feelings. The second is that a correctly designed tool will integrate well into classroom teaching to produce effective learning and finally that the same tool can be used to extend learning of these skills outside the classroom. As a result a software tool has been developed to help children engage with the features of character animation, while learning how to express their feelings through storytelling in films. By using the tool, children experience the major steps of character animation design in filmmaking and in this process, each step is specially designed to fulfil their needs and stimulate them to use emotions. Experiments were carried out both in the

classroom and out of school. The result indicated that older primary children had significant engagement in exploring emotional usage on the virtual characters and further analysis revealed children's engagement was associated with age, social adjustment and computer experience. Moreover, using tool-assisted teaching in the classroom could bring some positive effects which do not exist with conventional teaching. In the out of school testing, around half of the children had positive reactions to accepting parental guidance and some of them (including their parents) had significant engagement in exploring emotional usage.

Acknowledgements

I would like to thank my supervisor, Peter Blanchfield, who guided me to design and test the tool. I would also like to thanks to my friend, Kenneth McMillan, who has supported me and helped me to learn how to present the dissertation. Finally, I would like to thank the primary school teacher, Mrs Rebecca Stone, who helped arrange the tests in her SEAL course.

Table of Contents

Glossary

Cubemap: An environment mapping method used in the rendering of graphics such as when rendering an outdoor environment for projection onto six cube faces to create six square textures.

COTS Game: This refers to entertainment games in the current market and is used to differentiate them from educational games. A major feature of COTS games is that they are usually developed with large budget and specialist team development.

I CAN: a charity organization to support children with speech, language and communication difficulties.

MOGRE: an advanced .NET wrapper for OGRE. It can be used by C#, Visual Basic etc.

Moving Image Education (MIE): to use films, television and related texts, with many different aims and approaches in education.

OGRE: an open-source graphics engine. It offers rich libraries for developers to produce applications by taking advantage of hardware accelerated 3D graphics. It can be used to make games but it is not a game engine.

Skybox: a method which is an easy way to create realistic backgrounds. It is a cube with six landscape images, drawn around the camera. When players view from inside of this cube will feel they are in a natural environment.

Social and Emotional Aspects of Learning (SEAL): a curriculum component designed to develop various personal and interpersonal skills to help children positively engage with all aspects of their life and to become effective learners.

Special Education Needs (SEN): Refers to children who have learning difficulties and disabilities so that learning is more difficult for them than other children of the same age.

Speech, Language and Communication Needs (SLCN): It refers to those who have difficulties in communicating with others. A child with speech, language and communication needs may struggle to express themselves, have difficulty to understand and talk with others. It is often associated with poor behaviour, low academic achievement and isolation from others.

Speech and Language Therapists (SLTs): refers to allied health professionals who manage and treat people with speech, language and communication disorders. They often work closely with parents, teachers and other professionals.

Abbreviations

BSC: Broadcasting Standards Commission

CAL: Computer Assisted Learning

CBL: Computer Based Learning

CCEA: Council for the Curriculum, Examinations and Assessment

COGS: Communication Opportunity Group Scheme

COTS Game: commercial off-the-shelf game

DCSF: Department for Children, Schools and Families

DfES: Department for Education and skills

DfEE: Department for Education and Employment

DV: Digital Video

EBD: Emotional and Behavioural Disorders

ECM: Every Child Matters

ICT: Information and Communication Technology

ITC: Independent Television Commission

NFER: National Foundation for Educational Research

LEAs: Local Education Authorities

LTDU: Learning Technology Development Unit

Mogre: Managed Object-Oriented Graphics Rendering Engine

Ofcom: Office of Communications

Ofsted: Office for Standards in Education

OGRE: Object-Oriented Graphics Rendering Engine

QCA: Qualifications and Curriculum Authority

SEN: Special Education Needs

SENDIST: Special Educational Needs and Disability Tribunal

SLCF: Speech, language communication Framework

SLCN: Speech, Language and Communication Needs

SLI: Specific Language Impairments

SLTs: Speech and Language Therapists

TEEM: Teachers Evaluating Educational Multimedia

TOAL-3: Test of Adolescent and Adult Language - 3rd edition

TTA: Teacher Training Agency

FPLD: The Foundation for People with Learning Disabilities

YOIs: Young Offender Institutions

WAG: Welsh Assembly Government

CHAPTER 1

Introduction

Effective Communication is an integral part of daily life and is the core of every aspect of interaction with others. A major input from communication is crucial to successfully building interpersonal relationships and these relationships, especially friendship and other close relationships, influence our lives in many aspects (Nicotera, 1993). People who have good relationships usually live longer, enjoy good physical health and benefit from improved satisfaction with their lives (Duck, 1981). For example, the majority of Americans believe that their quality of life depends on the number and quality of their interpersonal relationships (Campbell, 1980). One objective of the communication function is to express people's thoughts and feelings to others, hence, what they say and how they say it can affect both speakers' and listeners' moods. Effective communication includes being good at expressing oneself and listening to others, not only to please oneself but also for others to enjoy.

Communication and interpersonal relationships have been defined as essential life skills by the United Nations Children's Emergency Fund (UNICEF), United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Health Organization (WHO). People, no matter whether adult or children, show their abilities to build various interpersonal relationships with others through communication in a positive way. Obviously adults will have more developed skills in terms of effective communication, as the ability to communicate is learned gradually, with development including what is learned at all ages. Thus, ideally development should begin as early

as possible.

Children, as beginners in learning communication experiences, may face many problems. The Bercow Report (DCSF, 2008) reveals that in the UK around half of children enter school with a lack of communication ability and for some this lack is more serious. All those who have poor communication skills can exhibit many difficulties relating to what is known as speech, language and communication needs (SLCN). The reasons for such difficulties are various. These include families with lower socio-economic status, children with hearing loss, brain injury, learning-disabilities and for some, the cause is unknown. The exhibited difficulties are also various, including difficulty in remembering information, expressing themselves and understanding what others say (Royal College of Speech and Language Therapists, 2010). After they have these difficulties, many children become silent, friendless, easily bullied by others, and feel lonely and easily rejected by classmates, when trying to make friends or join a group activity. Every Child Matters (ECM) (QCA, 2008), identified the five outcomes which are important for every child, these being, being healthy, staying safe, enjoying and achieving, making a positive contribution and achieving economic well-being. Regarding children with communication difficulties, however, the achievement of these outcomes is lower. A commonly suggested method for attempting to deal with the situation is to use early identification, with early intervention (DCSF, 2008). It is not, however, easy to identify communication difficulties in the early stages of development and thus, delayed diagnosis is common. Moreover, many children who have slight problems, such as language delay, may also require support to develop their communication skills, before they become worse. The conventional teaching methods used in school for learning communication skills have

proved to be efficient, after many years of continuous improvement. Reported communication difficulties also indicate, however, that these teaching methods may not be ideal in attempting to prevent the difficulties appearing. Some difficulties, of course, are not related to teaching methods, as the condition of some children, including those affected by such as hearing loss or social-environment problems require provision to offer appropriate support. There are also, however, some children who might benefit if exposed to a novel teaching approach which can be developed to assist conventional teaching to raise the effectiveness and enjoyment of learning communication skills and it may have additional value in reducing the risk of some children experiencing communication difficulties.

Many parents (50%) show concern regarding their children's communication ability (Long et al, 2008) but only a small number really understand the crucial nature of communication in the social, emotional and language development of childhood acquired skills (DCSF, 2008). The action taken to improve children's communication depends on the perspective of the individual concerned. For a teacher, the concern may relate to appropriate teaching methods used in the classroom. An educational researcher, who considers this problem of learning communication from a global perspective, would expect that all parents and families and society at large should understand that communication is an essential skill to be acquired. For example, the Bercow report (DCSF, 2008) offered many recommendations for government to transform provision, including raising the awareness of parents in understanding the importance of communication to support their child's development. As a parent it would be generally expected that there would be a wish to find ways of improving a child's communication ability. To achieve this it might be felt desirable to find a good

school with experienced teachers and in addition, various educational courses might be considered, to help develop communication skills in the home environment.

The motivation for the work in this thesis is thus to identify ways in which tools may be developed that could aid in the teaching of communication skills. The aim of this work might be summarised as determining if a specifically designed software tool that allows children to engage directly with the primary aspects of communication could be used to enhance children's learning of these communication skills. Thus a major objective of the work becomes the development of a computer-based teaching approach, to assist teachers in teaching children communication skills in the classroom and to give parents the opportunity to use their communication knowledge to teach their children at home. It is important to emphasise that this approach is not intended to replace the current teaching methods but will be used to assist in enriching the teaching methods already in use. This study product would also like to be considered as a valuable home-learning resource. Whilst parents may or may not stop children spending a lot of time watching TV and playing video games, some might wish to see their children playing with educational software, rather than the aforementioned, which may encourage violence and addiction issues. It seems to be the case that educational software, as with serious games, is considered as less playable than those games designed for entertainment only. As a result, the design of educational software, especially that for use in the home environment, should consider the engagement issues.

Educators are expecting more efficient ways of teaching children communication skills. A report from the Department for Children Schools and Family (DCSF) (2009)

stresses Professor Wolf's two important points: 1) *'Nothing about language development has isolated effects on children.'* 2) *'Many factors that children 'bring to the table' in the early years cannot be changed. Language development is not one of them.'* The report addresses the equal importance of children's enjoyment, emotional development and communication skills, within all subjects. A common idea is to use the performing and visual arts, such as role-play and drama, to ensure children have opportunities to express themselves through creative behaviour. The use of computer software for teaching communication skills is, however, rare. According to the UK National Curriculum teaching strategy, 'fitness for purpose' (DfES, 2006), the success of such computer-based teaching methods could further enrich the way in which children learn communication skills, so that their individual needs can be better satisfied.

The TEEM report (McFarlane et al, 2002) has shown that a wide range of skills can be developed by using educational software and it is unsurprising that communication skills are one such skill. An educational tool or game, which enables children to have a group discussion, is very likely to develop their communication skills during the process of the debate or negotiation. There is an educational software tool, called TalkDog Comic Online (BT Better World Campaign), which views the learning of communication skills as its only goal. It uses much stimulating material, such as an appealing dog, funny cartoon pictures, some mini-games and encouraging voice instructions, to enable children to mutually explore pre-designed communication tasks. Here, the major reason for using the computer is to supply the various stimuli to the children. As for the exercise of communication skills, this aspect should be achieved in the real discussion. This is indeed a valuable way of learning

communication skills, however, this thesis will examine another way in which communication skills can be learned from a virtual environment.

Currently, there is a lack of educational software which can allow children to practise communication skills in a virtual environment. It is possible that few researchers have considered the significance educational software for learning communication aspects can have. However, it should be noted that some difficulties can arise when a virtual environment is used to simulate the communication process. Some researchers (Realdon et al, 2006) explored the possibility of building an e-learning environment for communication purposes, to simulate the real communication process but the outcome was unsuccessful as communication is a multifaceted issue. Different people can use different ways to express the same meaning. For example, when people reject a proposal, they may say 'No!', 'Interesting idea, but…', 'sorry, I…', 'I'm not quite with you on…' and they may use gestures such as shaking the head and some serious expressions, to show their disagreement. As a result, in the virtual environment, there appears to be a problem as to how players can freely express their thoughts, using their preferred ways of speech. This problem can lead to another difficulty in that computers cannot autonomously process free speech, without imposing limitations on both speakers and listeners. Making a reliable rule for communication in a virtual environment is less likely to succeed, due to a lack of understanding of the detail of the complex human communication process. In this study, however, it is also not necessary to simulate such complex communication processes, as a limited simulation should be sufficient for children to use and this thesis will examine a film-based simulation which allows children to experience the communication process in a limited virtual environment.

1.1 Statements of Research Aim and Objectives

The primary aim of the research is to examine the potential of educational software designed to assist primary-aged children in learning communication, both in school and out of school. To express this aim, three hypotheses have been proposed.

Hypothesis one postulates that film production software which gives children control of character animation design may significantly stimulate their interest in exploring how to express their feelings.

Hypothesis two postulates that teachers may use this software as a valuable activity to assist teaching in their classroom for two reasons: 1) the film production software may make learning communication more effective; 2) with specific design, the film production software may meet the classroom needs including flexible topics, teaching relevance and lesson schedule.

Hypothesis three postulates that the character animation can act as a bridge connecting adults and children, so that parents/guardians can be actively involved in guiding their children to learn how to communicate effectively, whilst at home.

To test these hypotheses, the research is divided into several stages and each stage is listed, to provide an outline of the research process.

Initially, an overview of current practices in learning of communication skills is required, to understand how children learn and the problems they encounter. An

exploration of these issues can offer insight into what factors may influence children's learning behaviour and what strategies are used by teachers, researchers and speech and language therapists (SLTs), to support children in developing their communication skills.

The second stage explores the previous work of using educational software for learning communication skills and the possible benefits thereof in classroom usage. In addition, when placing the acquiring of learning communication skills as a priority some methods are likely to exceed the potential values of others. The review, therefore, gives an insight into using Media Education which has potential but has not yet obtained sufficient attention in the field of learning communication skills.

In the third stage, this thesis suggests a potential approach which suggests that the design of character animation in a cartoon film can enable children to learn some aspects of communication skills, such as expressing feelings. If such software does not yet exist, the design of such a software tool is required and the designed tool should support children within their competence, permitting them to control some of the aspects of character animation and design, particularly those relating to communication skills.

The last stage is to test the hypotheses. Experiments, including both classroom testing and out of school testing, are used to examine hypothesis one. Feedback received from children, parents and teachers through observation, comments and questionnaires is presented and analysed. Children's stories, facial expression designs and film productions are believed to be evidence of their efforts in expressing

feelings. The impact on learning outcomes and their engagement are assessed, through analysis of this feedback.

The classroom experiments were also designed to test hypothesis two and gather evidence that the designed tool can be a valuable teaching activity for teachers in achieving certain lesson objectives related to some aspects of learning communication skills. Children's behaviour in using the tool is observed and compared with another traditional teaching method which was conducted by the teacher. The effectiveness of learning communication and the applicability of the classroom usage are then evaluated through the analysis of their behaviour. In terms of being a useful classroom teaching activity, it is important to know whether the designed tool can fulfil the objectives of the classroom usage, including the cost, time and the lesson theme. Furthermore, the learning effectiveness must be proved, in order to encourage teachers to choose this tool.

Hypothesis three is tested in the out of school experiments, as well as with children and parents playing together to make a film by using the tool. The practical experience of parents teaching their children to learn communication is observed. The effectiveness of parental guidance is assessed through analysis of both parents and children's behaviour. The assessment of parental guidance also, however, needs to consider individual differences, both for parents and children. For parents, almost everyone is unique and their professional, and social skills and relationships are likely to affect their views of teaching and their ability in guiding children. For children, their age, preferences and other factors, may affect their acceptance of parental advice and as a result, reliable results require many parents and children to agree to take part

in the test.

1.2 Overview of chapters

Chapter Two discusses three major issues around children learning communication skills. The first issue identifies what aspect of communication skills is required for primary school children, in order to develop age-appropriate skills and how this is taught in school. The second issue describes the problems experienced in the learning process and emphasises the impact of poor communication. The last issue explores some theories and frameworks, which can support children in learning communication.

Chapter Three presents the existing educational software designed to develop children's communication skills, including foundation skills such as listening and advanced skills such as conversation and also presents a computer-based storytelling approach called Moving Image Education, which offers potential benefits for learning communication.

Chapter Four covers the exploration of Computer Aided Learning and Game Based Learning, in order to understand how the learning and engagement is achieved and also covers the development of educational software for classroom usage and the use of the cartoon concept to increase children's enjoyment and engagement.

Chapter Five includes the theory, design and implementation of the filmmaking software tool. The theory offers some ideas which can support the design in making learning more effective and engaging and also in adapting the classroom use of the

tool. The design process follows the basic steps of filmmaking as used in the industry but it is adapted appropriately to children's needs and learning theories. The implementation gives an overview of this filmmaking tool, to indicate how it works for children in learning communication skills.

Chapter Six details the process of the experiments conducted to verify the value of the software. The initial stage was the acceptance testing, which evaluated the usability of the tool and collected data for improvement. Classroom testing was then carried out in a local primary school, regarding learning emotions in the course of Social Emotional Aspects of Learning. Finally, the main part of the out of school testing was conducted at the Summer Scientist Week, which was an event organised by the University of Nottingham and in addition, several experiments were carried out in the home environment.

Chapter Seven presents the results and analysis of examining the three hypotheses, these being simply described as the potential effect on engagement, classroom teaching and parental guidance. The significant evidence is discussed and some statistics are provided to support the outcome.

Chapter Eight contains a short summary of this thesis and some suggestions for future work.

CHAPTER 2

Communication Development and Needs

2.1 Introduction

The development of communication skills requires a long term and comprehensive effort. It is essential to analyse this learning process in order to create innovation in using computers to support children's communication development. The school is a major place in which to teach children to be good communicators and also provide a suitable environment in which to reinforce their knowledge and skills through various types of practice exercises. This logically leads to a further consideration of what kind of skills children should learn for their age and how the school makes plans to teach these skills. There is no guarantee of acquiring these age-appropriate skills by every child and many children indicate various forms of communication difficulties during their study. Recently, these children have attracted the attention of teachers, educational researchers and some child welfare institutions, due to the fact that poor communication competence significantly affects children’s performance both in academic achievement and social life. All of these professionals emphasise that learning communication skills is crucial and children with communication difficulties need to be identified as early as possible and appropriate ways found to support them both in school and out of school.

The review in this chapter will explore children’s communication development and highlight those who do not develop age appropriated communication skills. As

regards children learning communication skills in general, the introduction will focus on what they should learn, in terms of both verbal and non-verbal aptitude and how they are taught in primary school. Then, an umbrella term, Speech Language and Communication Needs (SLCN) is explained and for the purposes of this thesis, the SLCN represents a wide range of communication difficulties including Language Delay, Language Impairment and many other communication disorders. The statement regarding UK children with SLCN has been summarised and possible reasons for these communication difficulties both in school and at home, are identified. The consequences for those with SLCN are then introduced, in order to emphasise the significance and importance of meeting those children's needs. The review also explores the current mainstream training strategies, including two available frameworks, whose purpose is to support these children who have communication difficulties.

2.2 Range of communication skills

This section will provide a general understanding of the aspects of communication skills which children should learn and give an overview of how they learn in school. All forms of communication can be categorised as verbal and non-verbal and the exploration of these will offer an insight of what factors can influence children in terms of interpersonal communication. Learning and teaching in practice, however, does not have to separate communication into verbal and non-verbal components, as they are often mixed and co-occurring.

2.2.1 Verbal behaviour in general communication

Verbal communication refers to both oral and written language, using words which are common to everyone (Gargiulo & Kilgo, 2005). Some special cases of communication can include the use of signing and of other symbols, such as Assistive Augmentative Communication Devices, which are specially designed to support disabled people to communicate with others (Keiling & Lenzo, 2010). In this thesis, verbal communication only refers to oral language, with the use of words.

The process of verbal communication is concerned with two main points (Keiling & Lenzo, 2010). One is that children should learn how to express their thoughts so that listeners can understand easily. Before speaking, children should formulate spoken language in their memory, thus they have to learn to put the words into sentences, with correct sequencing, grammatical rules and causality. Then, they have to make sure that their choice of words and sentences, as well as their clarity of articulation, are appropriate (Lee, 2008). Furthermore, children should learn how words can be verbalised to express their feelings. From the perspective of pedagogy practice and the nature of human communication, using tone of voice in oral speech is a very useful for children in expressing emotions. Trask (1999) suggests that tone of voice includes pitch, loudness, tempo, timbre and voice quality but on occasion, this term can be used narrowly, to represent only some of these features. Other than tone of voice, Keiling & Lenzo (2010) point out that the inflection and loudness are also important for children in displaying their moods.

In order to have a successful conversation, a series of verbal skills should be learnt by children. Lee (2008b) has shown five essential factors for children learning

communication skills: attention and listening, vocabulary, building sentences, story telling and conversations. Although this classification refers to the whole range of communication skills, verbal skills receive much more attention than non-verbal. In addition, Keiling & Lenzo (2010) have indicated twelve verbal skills which are critical to children, for example, initiating conversation, maintaining conversation, listening, sequencing and explaining. Basically, all of the above are considering similar skills for children in verbal communication. Take Lee's classification as an example *(The majority of these concern but are not limited to verbal skills):*

Attention and listening: listening is fundamental to any conversation and learning to concentrate is one of the major required skills during a conversation. Good listening mainly comprises three important behavioural skills. Firstly, children should sit or stand still when they are listening. This is a sign of paying attention to the conversation. Wriggling around can lead the speaker to feel a lack of attention to what is being said. Secondly, children should look at the person who is speaking to them. This is another sign of paying attention to the conversation, which has similar effects whether sitting or standing still. Finally, children should think about what the other person is saying. This is important in maintaining a conversation, as to do so requires answering questions and giving your comments. Moreover, listening is sometimes required in describing various sounds, for example, footstep, the wind and people talking. Listening may require remembering things that have been said, so that these things can be used in later discussion.

Vocabulary: as children are growing, they learn vocabulary, in order to build a dictionary in their mind so that they can find and use words when they are needed.

Children should learn to understand these words may be used in various ways. Some words are used to describe actions, such as jumping, eating and tidying. Some are used to describe the attributes of things, for example, size, colour and shape. Some words refer to a person, a city or a thing, examples being, Lucy, Nottingham and shoe. With appropriate vocabulary, children can understand things around them and learn new ideas. It is also essential for children to express their own thoughts. An important way for learning vocabulary is to let children enjoy these words, so that they can remember them more easily and enjoy organising them in their mind.

Building sentences: This is an important ability for verbal communication. Children should learn to put words together, in order to produce a sentence in an appropriate way. Learning includes putting the words into sentences in the correct sequence and with correct grammar and also combining short sentences into a longer sentence, so as to deliver complex messages with the sentence still being understandable. Sentences can be built differently within different situations or contexts and children can often understand more than they can say. As a result, repeated exercises will be essential to explore the ways of using sentences, thereby allowing children to learn and understand the magic of language and how it influences the things / people around them.

Story telling: Stories are frequently told in daily communication. The story content can be football news, shared information, such as the weather and personal feelings, for example things happening in school. Story telling is a good way to exercise vocabulary, paying attention and listening and building sentences, as it also requires some skills to narrate a story, which may be considered from two major aspects: what

to tell and how to tell it. What to tell is to decide the detail of the story, including the time of occurrence, the place, the people involved and their feelings. How to tell, refers to how to speak appropriately. These skills require the speaker to look at the listener and to speak out loud, using a suitable speaking speed, an animated voice and body language.

Conversations: conversation is linked to almost all aspects of life. A major effect of conversation is to develop a relationship with family members and friends and it can also be used to resolve problems and make plans. Conversation usually happens for a reason, such as asking for help, finding information, inviting some people, interviewing for a job and so on. Keiling & Lenzo (2010) propose twelve verbal skills and many of these relate to conversation skills. For example, they introduce how to start a conversation, maintain a conversation, give an opinion, plus explain and use telephone skills, which are very useful skills in daily conversation.

2.2.2 Non-verbal behaviour in general communication

'To most people, the phrase nonverbal communication refers to communication effected by means other than words' (Knapp 2006). This definition may not include some complex situations but it does explain the common forms of the non-verbal communication process. Non-verbal communication includes some major factors, which communicators may be able to adapt, leading to success in conversation and these are as follows (Knapp 2006):

- Expressions of facial emotion: This allows communicators to transmit information through the emotional expressions on their face. Communicators can express their personality, interests and responses in the interaction.

- Eye behaviour: Gaze is the major eye behaviour factor. It can express emotions, such as wide-eyed, for surprise and fear and it sometimes can be understood as communicators requiring the listener's response. Through eye contact, communicators may check a listener's attention and reaction, so that they know if the speech content is attracting the other's attention. Furthermore, people may avoid eye contact when things are difficult to deal with and people often look away when they are thinking.
- Vocal cues: communicators actively control the voice, so as to express variable meanings through tone, pitch, volume, rate and other form of cues, for example, disturbance -"well … er…". The emphasising of particular words in a sentence can underline the potential meaning, which the speaker wants to convey. This is the charm of using prosody in conversation. The voice can also express emotion, with subtle variations. This may not be as effective as facial emotion but the observer who sees a smile on the communicator's face, can have his impression confirmed by the voice.
- Gesture and posture: Gestures can be divided into speech-independent gestures and speech-related gestures. Speech-independent gestures usually replace words to express their opinions and people are aware of the use of gestures in speech communication. They can replace verbal speech in certain situations, in order to achieve something they do not want to say or are unable to talk about and it can also build or maintain attention. Speech related gestures usually accompany speech directly. It can be accompanied by a suitable gesture to show, for example, how big a space the speaker is referring to when saying: "There is huge space for…" and it can also be used to emphasise a word or sentence. Posture, gesture and speech are coordinated during a conversation.

- Touch in behaviour: Touch can give people encouragement, show warmth, and express emotions. The ‘decoder’ of touch depends on which part of body is touched, how strongly and for how long. It also depends on the surrounding environment and the communicator’s and observer’s culture and relationship. Sometime, positive touch is a good point for starting a conversation, as with kissing and shaking or holding hands.
- Environment: there are many surrounding elements in the environment which can influence people’s communication. For example, people may have a formal meeting, as opposed to people talking informally in the street. With the former, care has to be taken of the words used and as a result, some people may feel less comfortable and less relaxed.
- Other aspects include a comfortable conversational distance, the interpersonal relationship of the communicator and partner and the communicator’s personality. Physical characteristics such as hairstyles and dress can also influence people’s perception. For example, physical attraction may give a person a potential advantage in getting a job!

2.2.3 Development of communication in a primary school (KS1&KS2)

(The information in this section comes from curriculum guidance: DfES 2006 and DfEE & QCA 1999)

Key stage one

At the beginning of Key stage 1 (Year 1 to Year3), children begin to use vocal cues to enhance their speaking skills, such as speaking with an audible voice and using varying volume, space and emphasis, so as to enhance their meaning of speaking. Children start to learn some necessary skills for communication in group discussions.

These skills include taking turns, following instructions, sustaining conversation, attentive listening and comparing different viewpoints. The major method of children learning is to explore stories. Children understand story structures, the sequence of events and story language and respond in various ways to different contexts. For example, using experience obtained from stories to retell a story or make up their own story or using a role-play game to act out stories.

In Year 2, two new features of vocal cues, clarity and intonation, are introduced. Children learn to gesture, to support their communication through short dramatic performance. Children also learn that outside elements influence their mood and atmosphere, such as music, environment and dress. They learn to use pictures to give reasoning and to tell a story. Some skills, which were learned in Year 1, are further enhanced, such as learning some techniques to sustain the listener's interests. Children continue to exercise these skills in group-discussions and also connect to curricula, within different subjects.

In Year 3, Children learn new factors of non-verbal behaviour, these being facial expressions, tone of voice and posture, which allows them to explore feelings and emotion related issues, in different contexts. The new verbal communication skills include speech which has clear sequences and relevant details and which thus becomes more effective; children begin to share their ideas, explain their solutions, actively respond to others and comment upon other's opinions: they agree or disagree; children also learn how to engage the listener's interest. In addition, children continue to reinforce the communication skills which they have learned previously. They use enriching ways including, dramatic performance, storytelling, role play and

presentation, so as to practice their communication skills and identify features of communication skills from broadcasts.

Key stage two

Children learn to empathise with other people's perception. Taking a role-play game as an example, if children act the characters in a story, what are they feeling and what are they going to think and say? Children explore the fact that talking can be varied in different contexts, according to whom the children are addressing, the purpose of the conversation, what roles children are playing and the surrounding environment of the conversation. In a formal context, children speak Standard English, with a choice of vocabulary suitable to the occasion. Children can perceive the importance of music, words, imagine and compare their contributions in different contexts, through watching some short TV programmes and other performances.

Children learn to use various communication skills, in order to obtain or maintain other people's interest. These skills include drama strategies, such as exaggeration, humour and rhythm, plus persuasive language skills. Children identify the key points by attentive listening and using persuasive language skills, in order to reach agreement in a debate and they also consider alternative viewpoints. Attentive listening requires children to respond appropriately, even if others hold different viewpoints. The above is reinforced by children asking different types of question, so as to clarify key points and to pursue the speaker's idea. Children learn to use evidence and reason to support their views and to encourage persuasive speaking. Other verbal skills include impromptu presentation and some useful rules to sustain a conversation. Skills necessary for the communication process, which are learned as

described previously, are always integrated and practised in the next aspect of development.

2.3 Teaching methods in school

2.3.1 General understanding of teaching communication skills

Communication skills are associated with almost all curricula in school education. For example, children can develop their communication skills through discussion and debate with other pupils on the subject of citizenship (QCA 2001a - Citizenship at key stage 3) and in physical education, where dancing can enhance children's non-verbal communication skills (DfEE & QCA 2000 - Physical education). One of most important aspects for learning communication skills is the English Language lesson, which provides the majority of learning opportunities for communication. According to the requirements of English Language in the National Curriculum for England (DfEE & QCA 1999), English covers four foundation communication and language skills - speaking, listening, reading and writing in all key stages and further specifies requirements of communication skills in key stages 3 and 4. The requirements are as follows:

- *" Structure their talk clearly, using markers so that their listeners can follow the line of thought"*
- *"Distinguish tone, undertone, implications and other signs of a speaker's intentions"*

Another important curriculum for learning communication is Social and Emotional Aspects of Learning (SEAL) which is designed to develop various personal and

interpersonal skills to help children positively engage with all aspects of their life and to become effective learners. The SEAL commonly consists of five aspects: self-awareness, managing feelings, motivation, empathy and social skills (DfES, 2005). Although the guideline for the SEAL programme doesn't directly target communication skills, many aspects overlap and it is often seen that learning communication is part of its objective. The evaluation of the "primary behaviour and attendance pilot" (Hallam et al, 2006) confirms that the SEAL programme can have a major impact on children's communication skills.

There are no specific teaching methods for children learning communication skills. It is up to the school to decide how the curriculum requirements are implemented in their school (DfEE & QCA 1999). The scheme of work of the children, the teaching methods and the teaching materials, are decided by the teachers and the school. Schools are, however, recommended to use the national framework, in order to teach children literacy (Eurydice at NFER, 2011). These frameworks have been well organised to support and guide primary school teachers in developing the curriculum. Teachers can flexibly use these frameworks, based on their experience and whether they find these frameworks are helpful. They can choose to directly use or modify some of them, in order to better satisfy children's needs (DCSF & QCA - schemes of work). They do, however, have the responsibility to make sure that their curriculum meets the national statutory requirements (Eurybase, 2008). The above description of the school curriculum is for all subjects of primary schools in England, Wales and Northern Ireland.

2.3.2 Teaching methods in the primary school framework

(The following Information is from DfES 2006)

In the late 1990s, a Framework for Literacy and Mathematics was introduced, in order to raise standards and improve the teaching and learning in primary schools. The above was renewed in 2006. It is still non-statutory and schools and teachers have the right and responsibility to decide how or whether to use this framework in primary school education (National Union of Teachers, 2007). The use of this framework can support teachers in better achieving their educational purpose in primary school and children can benefit through a well organised curriculum. The framework also encourages excellent teaching and can make it more likely that children enjoy and engage in their learning. Schools continue to be encouraged to implement this renewed framework.

To better implement the framework, a range of teaching methods are suggested for each of the different educational levels (such as Year 3 Narrative - Unit 4). Each educational level contains a unit objective; several suggested teaching methods, including outcomes for each method and assessment of children's progress. These teaching methods are commonly designated as direct, inductive, exploratory, experiential, inquiry-based and problem-solving approaches. *"Research shows that particular approaches are more effective in supporting particular forms of learning." (DfES 2006)* As a result, the application of these teaching methods is encouraged to be flexibly applied, to follow learning in different contexts and according to children's needs. The framework calls these adapted teaching methods, "*fitness for purpose"* pedagogy and see this idea as a major impetus to successful teaching. This framework has a new classification based on the achievement of specific outcomes from teaching.

The new classification contains three main approaches, Direct, Inductive and Exploratory, which most teachers use. In the following paragraphs, each of these approaches will be explored, to see how they work.

Direct: This approach is also known as "Direct instruction", "Skills acquisition approach" or "Talking and telling" (Luckock et al 2006). The objective of this approach is to acquire knowledge and skills. Teachers demonstrate or illustrate the particular knowledge or skills to the whole class and children follow the given instructions to implement their individual or group tasks. Skills are primarily acquired by task-centred instruction and practise. Two key questions can help to understand this approach:

- *"How could you...?"*
- *"Why am I doing this?"*

Inductive: The objective of this approach is to develop a concept or process. Teachers give out a structured set of directed steps and children follow these steps to collect data, then filter them and examine them. During this approach, children may experience data classification, hypothesis production and testing. Two key questions can help to understand this approach:

- *"Can you group these?"*
- *"Can you see any pattern?"*

Exploratory: The objective of this approach is to use, consolidate or refine skills and

understanding. Teachers give out a topic for children to discuss and children have the freedom to decide what information needs to be collected and then they use learned skills to analyse the data obtained, to test their hypothesis. Two key questions can help to understand this approach:

- *"What might affect...?"*
- *"What possible reasons are there for...?"*

2.4 Speech, Language and Communication Needs (SLCN)

Children with speech, language and communication needs (SLCN), have difficulties in communicating with others. Some common signs of this problem are (Communication Consortium, 2008; Lee, 2008):

- They do not know how to speak appropriately in different social contexts and this may be explained by them not understanding the rules which are followed in such social interaction.
- They are unable to express themselves effectively. This can be because speech sounds are not appropriately processed, such as low speaking volume and problems with speaking fluently. There can also be a failure to observe grammatical rules in sentences.
- They cannot understand what others say to them. When a teacher explains a new idea or concept to them, they struggle to understand what is being said and implied. This can be a major barrier in the whole learning process.

The SLCN is used to represent people who have many forms of communication difficulties, however, the coverage of SLCN is vague and there are many different

terms which can be used to describe various difficulties with communication, such as Language Impairment, Language Delay, Poor Communication, Specific Speech and Language Difficulties. There is often confusion among people, in relating these terms with SLCN. The Communication Trust (Communication Consortium, 2008) explained the scope of SLCN by breaking down the language, speech and communication into parts and exploring each part. They defined the SLCN as an umbrella term to describe the whole group of children who have one or more aspects of communication difficulty and the difficulties suffered can be temporary or long-term, minor or complex and the needs can mean those of an individual child and the social support needs for his or her environment, which includes his play, learning, communication and life in general. Under this umbrella term, there could be many other terms to represent more specific difficulties in communication.

Children, whether at the foundation stage, primary school or secondary school, may have SLCN. In some areas, 40% to 50% of children enter school with delayed language (Locke et al, 2002) but there is a proportion of children who enter school who have a social disadvantage (DCSF, 2008). These children are seen as having mild delay in one or more areas of SLCN and they can catch up to reach the desired standard with appropriate support from teachers and parents (Communication Consortium, 2008).

It is estimated that around 5% to 7% of children and young people have complex and persistent SLCN, as significant difficulties (Communication Consortium, 2008; DCSF, 2008). The I CAN (Lee, 2008) takes account of this rate in practice situations in primary schools and it is anticipated that every classroom will have 2 to 3 children

with some aspect of communication difficulties. Those experiencing communication difficulties require direct and specific ways to teach them, while the Speech and Language Therapists (SLTs) are involved in order to make the desired progress. It should also be noted that some areas of SLCN have been identified as significantly influencing children's learning processes. For example, children who do not develop an appropriate vocabulary consistent with their age may struggle to understand what the teacher is saying.

SLCN is one of the more common conditions which cause difficulties for young children. A significant proportion (11%) of the cases presented to educational tribunals involve children affected by SLCN (SENDIST, 2007). Of the children who have been identified as having Special Education Needs (SEN), almost 23% have been identified as SLCN (Lee, 2008). Nonetheless, many other types of needs relating to SEN can also create serious communication difficulties, such as hearing impairment and autistic spectrum disorders. As a result, most children with SEN have some form of communication difficulty (TTA, 1999; FPLD, 2000).

2.5 Problems experienced in school and at home

Many surveys have clearly demonstrated that, in Britain, many children entering school experience various communication problems. In this section, these problems from mild to severe and are described in terms of a lack communication skills or language delay, communication difficulties, or Speech, Language and Communication Needs (SLCN).

A survey carried out in Wales (Basic Skills Agency, 2003) reported that more than half

of school teachers believed that half of all children starting school lacked communication skills and apparently related to this, were under-achieving academically, compared with five years before. Only around one in five children starting school was capable of writing their own name and of writing even a few letters. In addition, Ofsted (2007) has conducted a survey to evaluate standards, achievement and the quality of provision for children in the Foundation Stage, and identified a third of the standards settings in communication, language and literacy were under the expected levels of the Foundation Stage curriculum.

Sage (2006) said there is strong evidence to show that children entering school with communication problems subsequently experience retarded language development, thinking and communication skills. She draws this conclusion from reviewing earlier UK and USA surveys of children with communication related issues. Her review also explores the relationship between the development of thinking and communication and reveals the importance of concurrently building these abilities, in order to enhance academic achievement.

According to the Bercow Report (DCSF, 2008), on the practice review, around half of children start school in England with some form of language delay, one in 14 children are judged as having serious difficulties and are likely to have SLCN. Another survey, which was carried out by Local Education Authorities (LEAs) (Law et al, 2000), concluded a similar result that up to 10% of children are judged as having speech, language and communication needs (SLCN), and around 40% have some form of language delay in communication. The Bercow review also reveals that children with speech, language and communication problems frequently show signs of experiencing

other difficulties, such as behaviour, reading and writing difficulties. The aforementioned problems can continue for a long time, through school life and into adulthood (DCSF, 2008; Stothard, 1998).

2.5.1 Children in school

In the classroom, a common situation is that teachers talk and children listen. Sage said that, "*If teachers are talking for three-quarters of class time each student will average less than three minutes talk a day*" (Joy et al, 2000). Teachers have the responsibility to make sure that children's communication skills meet the national curriculum requirements. They have to control the amount they talk, in order to allow communication opportunities for the children. WAG's consultation document (2003), shows that speech, language and communication achieve less progress compared with the outcome from other learning areas. In addition, most teachers (70%) think that the use of games consoles, mobile phones, audio players and the Internet, could weaken children's communication abilities (Play Scotland, 2007).

2.5.2 Children at home

Children normally have many opportunities to communicate with their parents and ideally, parents listen and actively respond to questions. Children can learn and lead topics according to their needs, as there should be child-centred communication, in the home. (Joy et al, 2000). Unfortunately, however, all too often parents do not see the importance of interaction with their children. According to the Basic Skills Agency (2002), most teachers believe that, before entering school education, children would benefit from having developed some basic skills. Such skills would include

speaking out-loud and being able to understand and be understood; listening – have the ability to respond to an instruction; speaking – reciting and singing songs with rhythm; writing – have the ability to write their name and form some recognisable letters and asking questions. It would seem, however, that most parents do not realise the importance of developing such basic skills during the early years of a child's life.

Children quite often spend their time watching television and videos and playing games. Ofcom's report on UK children's media literacy (Ofcom 2008) shows children spending an average of 3 hours per day watching TV and videos. Teachers often feel that parents spend less time than is desirable communicating with their children, rather substituting TV and videos for beneficial interaction between the parents and their children (Basic Skills Agency, 2002).

Children have little chance to practice their communication skills with people, other than with the limited numbers of their immediate family, outside of school time. The Play Scotland Review (Play Scotland, 2006), reveals that nearly 33% of children never play outside and many children avoid playing outside, due to safety worries. Almost half of adults think that children can go out alone, only after they are 14 years old, otherwise, they have to have someone to accompany them (Play Scotland, 2007). A street play study (Lacey 2007) showed that parents prevent their children going out because they are concerned about child safety, feeling that their children may be harmed by bullies, strangers or speeding cars.

2.6 The impact on children with poor communication skills

Good communication is critical for children to enjoy success at school and to benefit

socially later in life. Children with SLCN, however, can have significantly negative effects in terms of developing a number of personal skills and abilities and it may further affect their academic achievements and behavioural, emotional and social development. Moreover, the impacts are likely to be reflected in low employability, high family stress and susceptibility to youth crime.

Personal skills and abilities are some of the more valuable assets, and a lack of them may lead to difficult situations. Mahyuddin and Elias (2010) summarise earlier research findings and conclude that children with poor communication skills find difficulty in joining an ongoing activity, negotiating a problem solution, participating in group-discussion and sustaining conversation with others. Moreover, children with limited language skills run the risk of being unpopular, as these children often express low self-esteem and find it more difficult to establish and maintain friendships, than do children with normal language development (Gertner et al, 1994; Rice et al, 1991). This puts them at risk of rejection and isolation by their peers (Hartshorne, 2006a). An example from the Bercow report (DCSF, 2008) can further illustrate this problem: a 15-year-old girl excluded a particular boy from her friendship circle because the boy's speech made the girl think he was unfriendly and that he teased her. Moreover, the social isolation is considered as a risk factor in bullying behaviour among children; therefore, children with SLCN are more vulnerable to being bullied than children with more typical development (Hartshorne, 2006a).

Children with poor communication skills often have allied low levels of academic achievement. A research study has shown that these children are at high risk of having learning disabilities and around 5 times more likely to have learning disabilities in

reading or spelling and around 10 times more likely to have learning disabilities in all areas, compared with children who are non-language impaired (Young et al, 2002). The I CAN (Hartshorne, 2006a) summarises some previous research findings and points out that children with SLCN can find that it significantly affects their performance in terms of literacy and numeracy. Almost all children with SLCN require some form of support with learning to read and write, otherwise, most would continue to have these difficulties when they get older (Hartshorne, 2006b). Without appropriate support, these children would have difficulties in passing exams (Rutter et al, 1992) and many would fail to complete higher education (Hartshorne, 2006a).

Children with poor communication skills are likely to carry these on into adulthood. Poorly developed skills and abilities can continue to have negative effects (Bynner and Parsons, 1997) but the impact of poor communication can vary according to the learning environment and varied social needs (Lee, 2008). The factor of employability is one of the more challenging aspects for people with poor communication skills, as they are at a disadvantage in the job market, especially regarding many occupations in today's labour market which require complex communication skills, along with high level language skills, literacy and numeracy skills (Hartshorne, 2006a). Even if they are employed, they are less likely to be promoted or to have training opportunities (Bynner and Parsons, 1997). The research also revealed that poor literacy and numeracy skills are associated with high rates of sick-leave, low confidence, low motivation (DfES, 2004) and earning less at work (Bynner and Parsons, 1997). In the United States, people with poor communication skills or hearing impairment, frequently suffer from low income and the results of the survey also confirmed that 43.7% of those with poor speech are in the lowest income group, which is 1.5 times

higher than that of the general population (Ruben, 2000). Other than problems in employment, people with poor skills in communication, literacy and numeracy, often do not actively join public activities or vote in elections (Bynner and Parsons, 1997). They also find difficulty in marrying and often have stressful lives, with poor living conditions. Many of them are still living with their parents and struggling for their independence (Hartshorne, 2006a).

The link between behavioural, emotional and social problems and communication difficulties has been explored from several different perspectives. Marton et al (2005) indicate that children with a specific language impairment express poor social pragmatics, such as the use of inappropriate strategies in negotiation or in resolving conflicts. Furthermore, they frequently withdraw from social interaction. Jerome et al (2002) reported that older children with specific language impairments are sensitive to feeling at a disadvantage in terms of academic achievement, social acceptance and appropriate conduct but younger children with SLI did not seem to notice any difference from unaffected children. Mahyuddin and Eliasm (2010) conducted an experiment and illustrated the correlations between oral communication skills and social skills, as well as demonstrating that children with good communication skills also have good social skills. A literature review by Bynner et al (2002) reveals that there is a relationship between Emotional and Behavioural Disorders (EBD) and language impairment, with around 3 out of 4 children diagnosed with EBD having serious language impairment and around 1 out of 2 children with language impairment being identified as having EBD. The I CAN (Hartshorne, 2006a) summarised several studies and reached the conclusion that children with poor communication skills should have appropriate ways to support them, otherwise they

are more likely to suffer behavioural difficulties, emotional difficulties and mental health problems, than are other children, when they get older.

Children with SLCN can also associate with youth offending and family stress (Hartshorne, 2006a). Bryan (2008) conducted an experiment in some UK Young Offender Institutions (YOIs) using Test of Adolescent and Adult Language - 3rd edition (TOAL-3) and illustrated that most youth offenders' speaking and listening skills are under average and around half of them are judged as having poor oral language ability. Davies et al (2004) investigated offender's literacy skills by using accredited standards from general offending behaviour programmes and the results showed that 57% of offenders' reading and writing skills were below level 1, which did not meet the demands of the programmes. These youth offenders, with appropriate support in the form of suitable training and education, can have the risk of re-offending reduced after their release (Hartshorne, 2006a). Children with SLCN can affect other members of their family. Parents may have to consider behaviour disorders of affected children or face other difficulties, which frequently co-exist with poor communication. Parents must consider their children's independence, job opportunities and life in society, as the children grow up (Botting, 2006). Parents also have to spend time, energy, effort and money with regard to the intervention, related to family support (Haynes, 1992). These are just some of the common stresses for families and these can be added to by stress related to individual cases.

2.7 Training for children with SLCN

Early identification, with early intervention, is crucial for children, so as to avoid a poor outcome (DCSF, 2008; Hartshorne, 2000a; The Communication Trust, 2010). If

children with SLCN are not quickly identified, many of them can suffer from one or more of the problems which are described in the impact of SLCN (section 2.6), such as low academic achievement, low social activity, behaviour difficulties and many other negative effects. Any delay in identification is likely to produce much pressure on the family and parents are likely to have to spend much more time, energy and money on supporting their children (The Communication Trust, 2010). In contrast, if children with SLCN have early intervention, many of them still have the possibility of overcoming obstacles, developing positive communication behaviour and making progress with many other impacts, including academic achievement (DCSF, 2008).

The children's outcome of learning communication skills is associated with those who work with the children in various fields, as well as those directly involved with the children on a regular basis. As speech, language and communication skills are central to a child's learning and development, with good communication ability, children can easily acquire the essential skills for life and work. Hence, everyone involved with the children should understand how the speech, language and communication development and needs are influenced in their work (Morgan, 2008). In Section 2.5- it is shown that around half of the children in the UK primary years have certain communication problems and some of these are seen as SLCN. Nonetheless, '*In many key areas of the children's workforce, current levels of confidence, skills and knowledge about speech, language and communication are low*' (Morgan, 2008). In those involved with children, Speech and Language Therapists (SLTs) play an important role in identifying children's communication difficulties and they provide support to fulfil their needs. It is, however, noticeable that the training of others in speech, language and communication, is also urgently required. They can assist SLTs

in many ways, especially when the lack of SLTs (DCSF, 2008) is frequently reported in the UK. Furthermore, with the increasing awareness of the importance of speech, language and communication skills across the whole range of those involved with children, more and more practitioners should develop specialist skills in this field (Morgan, 2008).

Collaborative working and a supportive environment are required to support intervention. Collaborative working between health services, education services, schools and the family, can offer a greater likelihood in meeting the various requirements of the children (Hartshorne, 2000a). In particular, parents should be placed in the central role, when joint working plans are made to support children with SLCN (DCSF, 2008). This collaborative working should arise at all levels, from the strategic plan making, to practical implementation (Hartshorne, 2000a). The Bercow report (DCSF, 2008) suggests building a, 'team around the child', to supervise a range of these services, including assessment, identification of needs and the process of intervention. A supportive environment is required, in which to create a learning environment for both children in general and children with SLCN. The I CAN (Hartshorne, 2000a) lists eight crucial aspects in building a supportive environment, such as raising opportunities for interacting, adapting adult language and taking part in decision-making.

2.7.1 Communication Opportunity Group Scheme (COGS)

(Joy et al 2000 & Sage 2000 & Sage 2006)

The COGS is a framework and also contains a teaching method for teaching children communication skills. Some children have normal intelligence, yet, they fail in class.

The COGS was developed to investigate the problem, which may occur when speaking and listening skills have not reached the same level as their reading and writing skills, during children's literacy and language development. A case study in Leicester (Joy et al, 2000) shows: *Katy, an 11 year old girl, involved in a clinical evaluation of language fundamentals test. She listened to a simple story and could correctly answer all questions from the story but she failed when she was asked to retell the whole story, using her own words.* Bell (1991) describes this situation as people experiencing, 'weak gestalt imagery'. People can process a 'part' but not the 'whole'. According to Bell, Katy lacks the ability to use her knowledge and experience to recreate the story in her memory. This kind of gestalt imagery weakness can have many negative effects on the development of children's communication skills, such as limited comprehension in oral work and reading and a lack of expression in speaking and writing.

The development of COGS is based on the successful experience of school skills, both in terms of academic and individual needs. It divides speaking and writing development into 14 levels and proposes ideas for each level. In theory, communication is the process of sending messages from one to another. The COGS further divides the message into four aspects: clarity, content, convention and conduct. The transmission of a message is affected by four main factors: Opportunity, attitude, personality and intelligence. In practice, a teaching method, named, 'tell, show, do and coach', is used. This teaching method involves, *'review, demonstration, guided practice, corrective and supportive feedback'* and encourages children to control their learning. (See also COGS in Class Talk: Successful Learning through Effective Communication, which gives further information of the COGS framework.)

Research studies show the COGS teaching method is positive. The teachers and parents identify children as being more confident at home and school. The test shows that children significantly benefit, in terms of communication skills. Their behaviour and reading and writing skills are also improved. The development of the COGS is designed to help children with special needs, such as social, emotional and behavioural difficulties and communication difficulty. This method can, however, be considered as an extension of the daily school literacy curriculum (Sage 2006).

2.7.2 Speech, language communication Framework (SLCF)

(The Communication Trust, 2008)

This professional framework was contributed by The Communication Trust, which was founded by Afasic, BT Better World Campaign, Council for Disabled Children and I CAN. It can support those involved with children and young people, to acquire related knowledge and skills in recognizing children who are experiencing communication difficulties and supporting them in satisfying their needs. It can also promote children's speech, language and communication development, either in children in general or children with SLCN. The design of this framework is appropriate for everyone who works with children, no matter what their roles, levels or experience of training, therefore including teachers, parents, speech and language therapists (SLTs) and any other people working with children, such as social care workers, sports, health and play-workers, who will all contribute to children learning communication.

The SLCF comprises four stages: universal, enhanced, specialist and extension.

- The universal stage is a foundation, which means that everyone who works with children should have this level of skills and knowledge. They need to identify the features of SLCN and generally understand the importance of speech, language and communication in relation to their work.

- The enhanced stage is for those who see the development of children's speech, language and communication, as an important part of their work. They need to pay attention to understanding the details of speech, language and communication development, as related to their work. They need to learn to help identify children who may have SLCN and also work with children who have been recognised as SLCN.

- The specialist stage is for those whose work primarily focuses on children with SLCN. They need to explore the link between the speech, language and communication and behaviour, plus social and emotional development. They are required to identify and evaluate children with SLCN in an effective way and their work includes helping those with complex needs, which may involve a mix of behavioural, social and emotional disorders. They must learn to give suggestions and decisions regarding SLCN to other practitioners who work with children.

- The extension stage is for people who have an excellent level of knowledge and skills as regards speech, language and communication. Those appropriate at this stage include teachers, speech and language therapists (SLTs) and educational psychologists. They are usually involved in research, in order to

be innovative, through reviewing existing approaches. They are involved in sharing their practice experiences and research outcomes, so as to support other practitioners in developing the required knowledge to advance their careers.

Each stage is further divided into eight strands. These strands refer to some major initiatives, which can have significant impacts on the children's speech, language and communication development, for example, strand G is concerned with parents, carers, peers and friends, who are playing an important role in children's communication development. The framework intends to give clear instructions for practitioners who seek to advance their professional development. These practitioners can use SLCF to measure their own competence, so that they know what skills and knowledge they already have and where they need further training. The SLCF also supplies ways to help practitioners access the required training and resources, however, there seems to be no existing evaluation report on the effectiveness of using SLCF. A recent experiment, which was conducted by I CAN and The Communication Trust (2009), used this framework as a pre and post training tool, to measure school staff competence development after training. Although this experiment did not intend to evaluate the SLCF, it does show how the SLCF can be used and that the use of SLCF can reflect some changes which are affecting teaching staff.

2.8 Summary

This chapter gives an overview of the process of child communication development and an analysis of those with SLCN. The verbal and non-verbal aspects of communication for children have been explained and an exploration of these will offer

an insight into what factors can influence children, in terms of interpersonal communication. The demands of verbal and non-verbal communication may, however, be treated differently by teachers in school. The National Curriculum Guideline in literacy indicates a worthy division of standards in verbal communication but the requirement for non-verbal communication seems to be unclear. Learning communication is not limited to a single curriculum but should be included in all aspects of every curriculum. In UK primary schools, currently, children are developing communication skills, especially in English and SEAL. Within national curriculum guidance, different schools can use different teaching strategies and teachers can decide what they think is the best for their students.

There are a significant number of children in the UK with SLCN, including those with mild and transient difficulties. These children, without developing age appropriate communication skills, are experiencing various difficulties in their social life and school learning. Many of these difficulties are no longer solely communication problems but extend to other areas such as academic achievement, behaviour disorders and family stress. Educational researchers and teachers show their interests in exploring how to meet these children's needs, so that they still have a chance to achieve normal development or at least resolve some of these problems. Some strategies are widely recognised, for example, early identification and intervention, whereas, some are long term strategies such as joint work among the various participants involved in promoting the best interests of the children.

All of the foregoing serves to emphasise the vital importance of recognising children with communication difficulties at an early stage and exposing them to suitably

designed strategies, these being directed by appropriately trained and highly motivated individuals. This should allow the affected children the optimum opportunity to gain the necessary skills, to permit them to develop to their maximum potential.

CHAPTER 3

Educational software for learning communication

3.1 Introduction

This chapter will examine how other educational software has been developed to support children in terms of communication related issues. Such development of software in this area is, however, relatively modest in terms of volume. Most existing software programmes, which are relatively modest games such as the BBC School website, are apparently designed to support the foundations of learning, such as vocabulary and sentence construction. The number of educational software programmes for advanced learning, however, such as conversation, is small. An emerging computer-based storytelling approach called, 'Moving Image Education' has, however, potential benefits to offer as regards learning communication skills but this technology has not yet obtained sufficient consideration regarding its value in terms of its contribution to learning communication skills. The detail of the moving image in education, with its software programmes, will be discussed.

3.2 Communication skills - Basic and advanced

To discover any educational software related to learning communication skills, it is critical to understand what is specifically being referred to as communication skills. The common usage of the term communication skills and its associated learning activities can be considered on two levels: conversation level and foundation level. At

the conversation level, some typical activities in the classroom where it is used would include role-play games or group discussions, designed to develop qualified conversations, hence children can learn such attributes as how to use gestures and postures to enhance speech, how to express themselves with emotions, how to make friends, how to maintain a conversation. At the foundation level, communication skills refer to various basic skills which are essential for children to be able to have conversations. For example, some of these skills refer to how to pay attention and listen to the speaker, how to use appropriate words, as well as how to construct sentences and tell stories. A more detailed exposition of communication skills can be found in Section 2.2. Educational software, which refers to learning related to either of these two levels, will be discussed in the following section.

3.2.1 Software for foundation learning

At the foundation level, educational software for learning communication skills is primarily found from two sources: BBC Schools (http://www.bbc.co.uk/schools/), and Teachers Evaluating Educational Multimedia –TEEM (http://www.teem.org.uk/). The BBC Schools provides various online activities and games, which are free for children to use both at home and in school. TEEM offers an evaluation of educational software and reports its usage experience in the classroom. The primary aim of these evaluation reports is to guide teachers to find suitable educational software because many of them are commercial products and teachers need informed advice before purchasing. According to their functional design and learning aims, these software programmes are further classified into vocabulary, attention and listening, building sentences and storytelling (Lee, 2008b).

Vocabulary: some educational games are used by children to assist in recognising synonyms. In the *code calling game (BBC- The magic key)*, children are asked to replace a red word in a sentence by picking out another word with a similar meaning from three given choices. When children make the correct choice, short, cheering animations, with lively sounds, are used to celebrate and encourage them to move on. In, *Matching Word Golf game (BBC- Bitesize),* a separate word is given without a context and children are asked to choose another word with a similar meaning. The features of the game include voice speech for introduction, golf-playing for animation, three levels for challenge and a trophy for the winner. In the *Word Balloons game (BBC - Starship),* the game provides the aim of helping Daisy to collect enough balloons, the balloons allowing Daisy to fly and reach the unicorn. Each time a correct choice is made, Daisy collects one balloon but the game can also be lost if players make too many mistakes. Every time a choice has been made, an emotional voice will indicate if the choice made is right or wrong. Some educational games are used to help children to increase vocabulary and to develop their memory. The, *Penguins on Ice game - Make it interesting (BBC- Starship),* which explores the use of adjectives and adverbs in a sentence, asks players to drag the correct descriptive word and place it in the appropriate gap, so as to make sense. *Scally's World: Verbs and Actions* (distributed by Topologika Software Ltd and evaluated by TEEM) is designed for 4 to 11 year old children, to assist in learning verbs and an in-built cartoon character – Scally - can perform related actions, which act out these verbs. The TEEM evaluation shows that this programme is very child-friendly and it can easily be used in a busy classroom, for increasing children's vocabulary and understanding.

Attention and listening: '*Bailey Bear's Walk (BT Better World Campaign and I CAN-Communication Cookbook',)* asks children to listen to sounds from a city or rural environment and then guess what is making the sounds. This game enables children to concentrate on their listening skills and encourages them to think about the sounds which surround them in their everyday life. *'Floppy and the Puppies'* (BBC - The magic key), illustrates animated speech, with appropriate emotion and the children have to choose the correct descriptive words to relate to the characteristic and thus complete the sentence. The *'sound monster'* (BBC - The magic key), offers four different sounds in each scene and children listen to these sounds and try to find the correct one to fit to the object in a sentence. '*Alien Abduction' (developed by BT Better World Campaign and evaluated by TEEM),* is designed to encourage memory development and listening skills in three missions. In the first mission, six abducted objects are shown, one at a time, in an alien spaceship and children are asked to identify them from a total of twenty objects. In the second mission, the number of abducted objects to memorise is increased to eight. The last mission, which is also the most challenging, is to remember the spoken content regarding information of the alien's planet, while also remembering eight objects. The evaluation report from TEEM indicates that children start to become more aware of the need to listen and heed, which otherwise might be quite challenging when there are some other sounds around them and it further leads children to discuss how to communicate with others in a noisy place.

Building sentences: *Kung-Fu Sentences game (BBC- Bitesize)* and *Penguins on Ice game - Make a sentence (BBC- Starship,)* ask players to put some pieces of words together in the correct order, so as to form a sentence. *Balloon Joining Words game*

(BBC - *Bitesize*), enables children to use correct conjunctions, to join two simple sentences into a complex sentence. Fraser the Eraser game (BBC – The magic key), which uses sentences as instructions to complete tasks, gives some clues, such as the colour and shape of an object and players must use these clues to click and drag a piece of a picture into the correct place. *The Grammar Show* (distributed by Sherston and reviewed by TEEM), uses various activities to illustrate the importance of grammar rules, in order to deliver the correct meaning in communication and to explain how these grammar rules can be used correctly in sentences. This programme is designed for 10 to 14 year old children and the evaluation shows that it can help teachers identify children's weakness in areas of grammar.

Storytelling: This is important in delivering news, sharing information and talking about our feelings, in the communication process (Lee, 2008b). In the area of educational software, storytelling exists to ask children to create, rather than simply read a story. The technology of, 'Moving image', is used in such a way and the details of, 'Moving images' and some examples, are exhibited in Section 3.3 & 3.4.

3.2.2 Software to support advanced learning

At the conversation level, this refers to how to improve the quality of conversation, including the using of emotional speech, facial expressions, postures, gestures and various conversational skills, such as building relationships, greeting each other and explaining and describing things. Many of these high-level communication skills are featured in the UK subject of Social and Emotional Aspects of Learning (SEAL). There is, however, little evidence to show that schools have ever used computer-based techniques to support this learning and the number of educational software

programmes for this level is modest. Only one online resource, “TalkDog Comic Online”, has covered many aspects of learning communication skills. Another game, “Making faces”, which covers a small area of communication skills, explores the connection between facial expressions and emotions. *TalkDog Comic Online* and *Making faces* will be referred to further in the following paragraphs.

TalkDog comic Online (BT Better World Campaign), is an interactive resource and was designed to enable children to develop their speaking and listening skills. The resource is aimed at two age groups, those from 5 to 7 years old and from 7 to 11 years old. The resource contains six modules: All about Communicating, Describing, Listening, Finding out more and Understanding and Being Fair. Each module has activities and games, with a uniform cartoon style acted by Talkdog, a cartoon character and its friends. A range of supplied materials can stimulate children’s discussion and encourage them to debate with each other. The resource is suitable for individuals, groups or whole-class use. Supporting documents are supplied to teachers and parents. Teachers can follow all modules sequentially, as part of literacy teaching and they also can select any part of the modules, to integrate within their own curriculum plan. All modules are flexible and can be used in any order. The feedback of classroom evaluation made by Abigail (a teacher from TEEM) shows that children appreciate this resource and they display a strong motivation to use this resource and also appear to derive pleasure from engaging with it. The highlight, as far as the children are concerned, is the use of the style of comic and cartoon characters. Abigail, who evaluates this online activity resource in her classroom comments: *“The lesson plans provided lots of good ideas which I was able to adapt to suit my class”*. Children also find many opportunities to develop their verbal and thinking skills.

Making Faces (BT Better World Campaign,) is designed to link a person's emotions to his/her facial expressions. It is a cartoon style game, with comic expressions. Children can drag selected eyes, with appropriate eyebrows and mouth shapes into a blank face, so as to produce expressions. Blank faces being used also allow changes, to produce various cartoon characters. The game task is to design facial expressions, which can match 20 emotions on the left-hand side of the screen. A TEEM review supplied evaluations of this game regarding both game content by Wilson and classroom experience, by Corbett. The game is suitable for children in the age group from 7 to 11. Those aged from 5 to 7 may find some emotions, such as suspicion and disgust, difficult to understand. Children also need help in recognising the difference between some emotions, such as being happy and being very happy. The classroom evaluation shows children much appreciated this game and could match all the facial expressions and could use them all, plus, the game was enjoyable to play. Corbett thinks the game could develop children's ability to recognise people's feelings and to learn to react to these feelings.

In order to have a better understanding of how best to proceed with designing any new and progressive software, specifically targeted at teaching and enhancing children's communication skills, it is first necessary to make an in-depth study of such work as has been done to date in the field. The study will thus now consider various important aspects of the development, commencing with the relevant software developments.

3.3 Making stories in Moving Image Education (MIE)

3.3.1 What is MIE?

A general description of MIE is to use films, television and related texts, with many different aims and approaches (Scottish Screen, 2006). The moving image may, however, exist beyond the film and television genres. The British Film Institute (BFI, 2003) adds video on websites and computer games, to the moving image media list. Some researches suggest that the moving image concept can extend to include other aspects, which are not 'moving' by themselves, such as presentation, storyboarding and comic strips (Madden et al, 2009; Burn and Parker, 2003). Moreover, the moving image is frequently mentioned along with media, in relation to the difference between moving image literacy and media literacy. Based on Bazalgette's (2009) viewpoint, MIE and its literacy are primarily used in the UK by some organisations such as the British Film Institute and Scottish Screen, to specify their work regarding the moving image media, where media literacy, as a generic term, has been widely used in both the UK and international scenarios. The Commission of the European Communities (2009) defines media literacy as referring to all media, including the moving image (such as film and television), radio and recorded music, print media (for example, newspapers), the Internet and all other new digital communication technologies. People who would wish to specify their work on film related matters may use Moving Image Media (Scottish Screen, 2009), Film Education (BFI et al, 2008), Screen Media (Scottish Screen, 2009) and Cineliteracy (BFI, 2000) (literacy in moving image), to emphasise their expertise.

'Literacy is the repertoire of knowledge, understanding and skills that enables us all to participate in social, cultural and political life (BFI, 2008)'. The Film: 21st Century

literacy (BFI et al, 2008), believed that the understanding of literacy in the digital age is changing. People who are familiar with text on a page should also be familiar with images on a screen and confident in using a camera or keyboard, treating them in the same way as using a pen. The Scottish Screen defined the concept of moving image literacy is being an outcome of 'reading' and 'writing' in moving image media and children should understand, enjoy, explore, create and share them (Bazalgette, 2009; Scottish Screen, 2009). The British Film Institute suggests that the moving image media should be integrated into school for literacy teaching, as it can support children to, 'talk, think and write creatively and purposefully' (BFI, 2003). The Film: 21st Century literacy (BFI et al, 2008) describes film education as enabling children and young people to access a wide range of film, to raise their enjoyment and encourage their learning. For example, they have the opportunity to understand the world, express their own opinions, raise emotions and stimulate their creativity through debate and discussion regarding the issues of a film or even the making of a film. The Office of Communications (Ofcom, 2008) is of the view that, 'media literacy is to access, understand and create communion in a variety of contexts' for everyone and media literacy can give people the opportunity to develop their competence in managing their media activities and to become confident in participating in the digital society.

MIE in practice, involves watching and listening to a wide range of short film or video texts, then teachers and children can together discuss and analyse them (BFI, 2003). The British Film Institute has developed eight basic techniques for teaching, for example, using the pause button to 'Freeze Frame' when a video is playing and then teachers can ask children what they can see from this static image or some other

questions, which focus on such aspects as characters' emotions, gestures, location, and camera movement. Teachers can also guide children to analyse the narrative structure and content in moving image media, in order to understand how a story is told, by exploring story sequence, scene setting, its beginning and ending. These skills and knowledge can be used to enhance children's storytelling ability, so that they can create their own story writing. With regard to another aspect, MIE involves creating a short film production and in this way can enable children's creative development, as they can arrange the use of characters and their animation, film artefacts, music and story plot amongst other things (BFI, 2003). According to Scottish Screen (2009), it is not necessary to create a large-scale film production project but any digital storytelling, for example, a storyboard, can benefit children. Many educational software programmes have been developed based on film making to tell stories and the detail of these applications will be discussed in section 3.4.

The current work of MIE in UK organisations and agencies is in its initial stages and the target population primarily focuses on children and young people under 19 years old (BFI et al, 2008). In 2005, a Charter for Media Literacy (media literacy was introduced to represent a broader media than that represented by moving image literacy at the European level) was drawn up by a UK media literacy task force, representing industry, government and education. It set out a key definition of media literacy along with its properties, for public debate and discussion. The aim of the Charter for Media Literacy was to increase the understanding of media literacy and raise its importance, indicating that it is essential for everyone in the digital society and also to encourage more individuals and organisations to participate in its development (Screen West Midlands, 2007). In particular, the 'three Cs' of Charter for

Media Literacy are recommended by most media educational organisations in the UK to be integrated into media literacy development. In Film: 21st Century literacy (BFI et al, 2008), the three 'Cs' in film education are described as:

> **Cultural access**: An opportunity to access a wide range of films so that learners can understand culture, society and history in different areas with different people.
>
> **Critical understanding**: Learners develop critical skills to analyse film and understand its forms, content and qualities.
>
> **Creative activity**: Making film or other moving images provides learners with an opportunity to understand film techniques and express their own stories, emotions and ideas, in a creative way.

All three parts can support each other in learning, thus they are suggested as combining to form an approach to the MIE.

3.3.2 The impacts of MIE

Several papers in the UK have explored the benefits of MIE regarding particular aspects in their research. The British Film Institute (2003) suggests five arguments of learning experiences in MIE, for 3 to 11 year old children. Scottish Screen (2006) explores detailed benefits of using moving education media in school-based situations, involving input from pupils, teachers and head-teachers, all of whom were directly involved in their MIE programme. The Film Agency for Wales (Sharma, 2009) conducted a Ffilmschool 2 project during 2007-2008 within five schools, to study the impact of MIE in children aged from 10 to 11 years of age. Scottish Screen (Bazalgette, 2009) produced some reliable evidence to support the impact of MIE, through a review of recent assessment reports concerning moving image related

matters. All these findings can be summarised by the following:

MIE enhances the information and communication technology (ICT) skills in schools. Film education in the case of the Scottish Screen programme and the Ffilmschool 2 project require children to receive some training in the use of film editing software (Such as iMovie) and hardware operations, such as the webcam, digital video and sound recording equipment. The feedback shows children become more confident in both operating digital film equipment and film editing software. In the Ffilmschool 2 project, many children thought that the training they received during the ICT training workshop would bring long-term benefits in later work and also, many of them felt relaxed and had become more confident in working with computers and related software. The Scottish Screen programme reports that children can develop word processing skills in the same way as they did writing activities (functional writing, individual writing and imaginative writing) and children will gain experience in the use of email and the telephone because there are recommended to contact other agencies, such as the Angus digital media centre.

Much of the work in both film analysis and film-making are group activities and these processes are especially useful in developing various team-work skills. Take film analysis as an example; this work process provides many discussion topics relating to children's experiences, so that there are many opportunities for interaction and communication, where children listen to other pupils' ideas and give their own view points. This can enhance children's confidence in expressing their thoughts and thus, increase their self-esteem. Furthermore, the Scottish Screen reported that children were using compromise to gain agreement during discussions. In the filmmaking

process, children are asked to play different roles in the group project, such as the writing of character descriptions, storyboarding, animating and editing their film. They are given the opportunity to work independently but also they have the responsibility to fulfil their designated role. They are all involved in contributing to the overall project, so that they must take part in group discussion, as well as performing their own tasks. Their work is, by nature, collaborative and they have the opportunity to accept leadership roles in managing their project, make decisions and thus, further develop their self-confidence.

MIE can improve children's individual development regarding four aspects: critical thinking, self expression, creativity development and writing skills. Children are encouraged to '*distinguish between fact and opinion, to consider cause and effect and to take account of different viewpoints*' by applying critical thinking to the analysis of moving image text. Critical thinking is also expressed in some evaluation work, such as formative assessment being applied in the writing and peer assessment is encouraged in the giving and acceptance of criticism (Scottish Screen, 2006). The Ffilmschool project 2 has shown that MIE offers a great opportunity for children to have and develop self-expression because they can use different forms of media to convey their thoughts and ideas and can communicate with others to share their own opinions and preferences. All papers refer to the fact that creativity development is one of the important features involved. In MIE, children have many opportunities to demonstrate their creative behaviour because the moving image media is able to stimulate children to generate and extend ideas, hypotheses, imaginative options and alternative solutions and they can also practise these thoughts in the making of moving image media. As a result, many positive behavioural aspects have been

addressed, including creative writing, creative interaction, creative thinking, creative use of music and poetry in film and the creative filmmaking process. Another commonly reported feature is the opportunity to improve writing skills. There are many writing exercises in either analysis or making moving image media. For example, children can be involved in narrative writing, character description, story settings, plus, the opening and ending of a story, as well as peer assessment. Within these activities, children are encouraged to use emotional and figurative language, distinguish the difference between the first person and the third person, know how to set a story and understand how these settings can influence events and characters. Moreover, children become careful observers, as a result of the observation of characters in depth and detail, meanwhile, all of these new skills are transferable into their writing and hence their writing quality can be enhanced. There are also some teachers and children who feel that these writing exercises set a clear goal, which increases children's interest and stimulates them to write creatively and thoughtfully.

MIE can link home and school. Based on a Marsh (2005) study, 96% of children start to watch television and 72% can switch on the television by themselves by the age of 2. Around half of children can use a mouse to point and click and one third can use it to look at websites by the age of six. It is reasonable to assume that children have significant practical knowledge about media when they enter school. MIE in schools can build on this fact, to give children new insight regarding knowledge and understanding, and also enable children to reflect systematically, when reading and writing as regards moving image texts. In addition, the use of moving image texts at home is often seen as an effective way of extending formal learning, which can support many parts of the curriculum in the cultural area and its associated learning.

For instance, to some children, the fact that the home allows extended MIE can raise their engagement, make them capable of abstract thought and be more imaginative and able to cope with complex issues and challenges within the culture which surrounds them.

MIE can help develop children's emotional skills. In film and on television, drama plays an important role in emphasising the expression of feelings and the link between character action and their associated moods/emotions. Many children have shown great interest in exploring drama elements, so as to understand a character in depth and learn to develop it. More specifically, children learn how music, tone of voice, body movement and facial expression can all influence emotions. For example, they learn how music can be used to create atmosphere and reflect emotions. The Scottish Screen reports that children adopt examples of these emotional features from different films to help each other in analysing and understanding various feelings. Moreover, children are able to develop a wider vocabulary in order to describe emotions and moods. Many of them stated that they have become more confident in using specific emotions verbally in different contexts. In the film making process, children also have the opportunity to experience using their emotions on their own and understanding how emotions are used within the film language.

Besides the above-shared features, some papers have their own specific emphasis. The Review by Scottish Screen (Bazalgette, 2009) reports that MIE encourages previously excluded children to access the curriculum and MIE is thought to be a new way of teaching the key literacy concepts. The British Film Institute (2002) explored the importance of active learning and suggested that MIE could support it and guide the

learning experience from the new, to the unknown. Scottish Screen (2006) referred to children having the responsibility to identify and solve problems when they are making films and in this, they use various problem solving strategies to evaluate and test possible solutions.

Although these benefits may require further evidence to support them, the above first hand experiences do provide a general impression of MIE in schools. Worldwide, the UK, Canada, Australia and the USA, have started to teach media literacy in the school curriculum (Penman and Turnbull, 2007). In the UK, the number of children actually involved in media literacy in school is still very limited and the exhibited challenges are numerous (BFI et al, 2008).

MIE, as a new way of teaching, is unfamiliar to most teachers. The current activity of using film education in or out of the classroom largely depends on teachers' personal preference and commitment (BFI et al, 2008). Besides this inadequate consideration as to the merits of using MIE, another major barrier is that most teachers have little or no training in this area to support their professional development in MIE (Buckingham, 2005). Reid et al (2002) report that when children are involved in film production, the quality of production is closely associated to the teachers' expertise in the moving image language.

There is still no consensus as regards teaching methods in MIE. Compared to other curriculum subjects in primary school, MIE does not have '*sustained, coherent programmes of learning with clear progression routes, and no systematic means of using film education to explore other, related topics such as intellectual property and*

respect for copyright' (BFI et al, 2008). Many research studies have reported their experiences on using MIE in school but they rarely share understanding as to what ideas or approaches are suitable to follow in order to establish good practice, nor is there an agreed measurement to evaluate its quality and effectiveness.

Other reported problems are as follows:

- The school allocation of time for MIE is often insufficient, as the whole process of film-making is time consuming. For example, according to the experiments of a Digital Video (DV) Pilot scheme (Reid et al, 2002) children should learn, amongst other things, the use of a camera and associated equipment, writing scripts, knowledge of different shots and the use of iMovie software. Shooting the film, in particular, takes some time to complete. In normal circumstances, MIE requires the allocation of sufficient time, this probably being in the region of a few months (Reid et al, 2002), a year (Sharma, 2009) or even several years (Scottish Screen, 2006).
- Lack of educational software for use in developing children's learning and understanding of animated film within the relevant curriculum (Parker and Sefton-Green, 2000; Buckingham, 2005).
- Many existing software products for making or telling stories restrict children's creativity because they use linear editing, with pre-given stock images and characters (Parker and Sefton-Green, 2000).

The schools frequently lack the appropriate equipment to support the film making in MIE, especially as regards video editing machines (Buckingham, 2005).

3.4 Previous work in MIE

3.4.1 Introduction

When children are involved in the filmmaking process using a digital video to record, some software is required in order to produce a film. The priority requirement is for video editing programmes. Video editing combines multiple video clips into one, together with some background music, titles on the video, scene transitions and voiceovers. None of the video-editing programs are, however, designed for use by children. The current software for video editing in schools are commercial programmes and the two most referred to are *Apple iMovie* and *Adobe Premiere* (BFI, 2003; Parker and Sefton-Green, 2000). *iMovie* is suitable for anyone who wishes to produce a home made video but who lacks previous experience and the British Film Institute (2003) says that the interface design for children is '*intuitive to use and very difficult to get lost*'. *Premiere* is more complex and suitable for experienced users, as it offers many advanced functions, both in regard to its special effects and editing and the fact that it can directly record animation through a fireWire cable link to a camera (BFI, 2003). Besides the video editing software, some software can assist this editing process. For example, The British Film Institute suggests using Apple iPhoto and Adobe Photoshop for the image manipulation; the Scottish Screen in the MIE programme uses Apple GarageBand for creating and designing music and Boinx iStopMotion for producing featured animation (Scottish Screen, 2006). So far, these commercial programmes have already been used in MIE with some positive contributions, according to feedback, but few researchers have actually evaluated whether these programmes are suitable for school use. On the other hand, it can be imagined that the complexity of these programmes would deter children but there is currently little other option as child-centred software in the area of video editing is

minimal and currently the best option is to select the most appropriate version from the commercial programmes available.

The above film making process follows a standard approach in the industry and it is also a mainstream teaching approach in UK MIE, however educational software which shadows this professional film making is rare and many existing software tools are designed to assist children's learning, by making stories. Software tools for making stories is often seen as a simple way of film making, which makes use of tool owned materials, with suitable editing, to present a story. These stories can be complex, as in a cartoon film or as simple as a storyboard, with simply some image sequences with texts. It is commonly felt that making a cartoon film is more difficult than others forms of visual stories, for example, storyboard, comic strip and presentation but cartoon films offer more opportunities for children to explore a fantasy world. For example, Kahootz3.0 supplies a large amount of scene material and characters, with which users can change the weather of the scene, make characters dance, as well as other variable virtual effects and animation. It is fair to say that cartoon films have a large potential value in terms of the development of children's engagement.

3.4.2 Kahootz and MediaStages

There is no clear means of distinguishing a tool which is related to making cartoon films from those relating to other visual stories. Software tools, which are targeted at learning by making cartoon films, are not necessarily exclusively so and are also not all essential in achieving all of the features of a cartoon film. In addition, tools related to making other visual stories can also bring in features of films, to enhance the

engagement and learning behaviour of children. Thus, Kahootz3.0 and MediaStage are two tools primarily focused on making cartoon films but which can also be used to bring quality animation and many other film features to the cartoon.

Kahootz (www.kahootz.com), which was developed by The Australian Children's Television Foundation, is a professional software tool for children aged from 7 to 15, for the making of 3D stories, games and presentations. The latest version, Kahootz 3.0, was released in 2008. This tool contains a rich resource of pre-built environments, characters, objects and music, plus a range of film and games-based features, for example creating and linking different scenes, changing the world environment, special visual effects - animated world, multi-track sounds, character actions and object movements. All of these can be combined to produce a very appealing product (Madden et al, 2009). These features have already been developed for adapting to children's needs, which makes making animation simpler but inevitably, professional knowledge is required to drive these features. Both students and teachers have to spend some time training in order to fully control these features but the training process is an engagement exploration and it can be a part of the learning objective in the classroom, with careful plans and arrangements. The tool enables children to express their creativity and encourages them to share their individual products through a linked, online community. Samples on the official website have revealed that there are various ways of using the tool in the classroom and some possible subjects are Social Studies, Science, Mathematics, ICT and English (Maggs, 2008). These samples have also shown that it is a useful tool with which to develop personal skills and abilities, which are significant in enhancing children's learning behaviour throughout the curriculum, for example in terms of creative ideas, analysing, problem solving and

critical thinking. In the UK ‘schoolzone evaluation’ (Cooper, 2008), Kahootz3 was used in a Fourth Year class, with four sessions in a course. Children initially watched other students’ film products on YouTube, so that they understood the capabilities of the tool. During the experiments, children showed great interest in exploring the various tool offered resources, such as objects and environments. Children had a wide variety of ideas when they were involved in different parts of the tool operation and were involved in much discussion regarding storyline editing and environment choices. It is also reported that children learned to modify their language, to adapt to different situations, when they were recording their voices for a scene.

MediaStages is developed through the cooperation of Immersive education and Futurelab. The early version was released in 2003 and there is now an updated version (Owen, 2003; Burton-Wilcock and Shaw, 2009). The tool has some common features in comparison to Kahootz. For example, they both contain a rich resource for creating scenes with related character animation and both offer the use of storyboarding and scriptwriting to create 3D animation sequences in making stories and films. Mediastage, however, places its emphasis on human behaviour and is designed for older children who are at Key Stage 4 (but it may be extended to include Key Stage 2 and 3, as is mentioned in the Teacher Support Pack). This is reflected in two major differences from the aforementioned. Firstly, the shape of characters, objects and environments in Kahootz is cartoon style, with bright colours, whereas Mediastage is more concerned with the detail in reproducing real world events, thus, Mediastage allows children to edit scenes in depth, to arrange the plot of a story, while the camera and lighting can be suitably placed to create the desired atmosphere. Secondly, a major feature of this tool is the use of advanced character animation, which includes

movement, pose, emotional state and lip-sync, to model human behaviour and it is expected to support children in terms of social, emotional and behavioural aspects of learning. A result of the report from the evaluation group TEEM reported that the tool can be a little difficult to use in the initial stages and thus both teachers and students should spend some time on suitable training (Halliday -TEEM). It also reported a possible advantage, which is that the tool can allow children to experience using cameras and lights in the digital world, rather than using expensive physical cameras and lights, for learning media skills. In its latest form, MediaStage 2.0, the Teacher Support Pack introduced the tool, which is intended to support children in three creative subjects across the curriculum: 1) PSHE and Citizenship for learning relationships and the issue of bullying, 2) ICT for media studies - advertising agency, and 3) English, to support literacy learning.

3.4.3 kar2ouche and 2Create a Superstory

There are many tools available for learning using other visual stories, kar2ouche and 2Create a Superstory being two typical examples.

Kar2ouche is a creative toolkit developed by Immersive Education and can be used to create storyboards, animations, posters and other publications from a rich library of images, together with texts and audio. Each shot of a scene is designed by adding background images and 3D characters and props (Madden, 2009). The tool also allows the user to change character poses, give objects special effects and make simple stop motion animation. In addition, it supplies a range of pre-made storyboards and many resources for children, with which to build their own version. These rich, pre-made storyboards and resources are packaged into many different products, to

fulfil specific curriculum needs. For example, the pack of Egyptians, designed for History; Earth and the Environment, is suitable for Science learning and Respecting Diversity and can be used in PSHE & citizenship. Different products are suitable for different age groups and the overall products are used in both primary and secondary teaching. In a classroom evaluation (Cartwright - TEEM), Romans pack is used for Third Year children, in small groups, to create a storyboard based on their knowledge of a Roman bathhouse. During the experiment, children often use a role-play strategy to create the scene and explore the relationship between a servant and the person to be served in a bathhouse. Children enjoy using this tool, as the outcome can result in producing professional visual stories, using only simple manipulation. In another case study (Thomas, 2006), the tool was used to motivate children as regards writing. The result was very impressive, as children became significantly engaged in the story writing and thought that this offered an entirely different experience from traditional writing lessons.

2Create a Superstory has recently been released by 2simple Software and won the best primary ICT resource in 2010, at the Education Resources Awards (www.besa.org.uk). The tool is developed based on its previous product, 2Create a Story and many additional features have been added to engage the older or more capable children (Bell, 2010). The overall impression gained is that the tool offers many creative ways for children at Foundation and KS1 levels and it integrates text, animations, sounds and pictures with some art designs, to make various story books such as an activity book for simple drag-and-drop elements, a reference book for non-linear writing, plus a scroll and age-related book for the historical stories (Haughton, 2010). The tool offers many pre-made animation aspects and children can be involved in simple

manipulation on the basis of the original design, such as object movement, as well as scale and rotation on the timeline. The final production is a combination of simple flash-style animation with texts and audio, to make talking stories or simple games and they can then be saved as Flash files to publish, such as on the 2CaSS online website (www.2cassarchive.co.uk) which collects various products created by teachers and children and comments can then be received from others. There seems, however, to be a lack of formal evaluation but its previous product, 2Create a Story, which has been evaluated by TEEM, has shown that children enjoy producing this style of story and it is a good way to develop their creative writing (Cumbo - TEEM). A review from Haughton (2010) opined that the tool has become easier to use than the previous products and it can stimulate children as regards their creativity and reflection, when creating stories.

3.4.4 Conclusion

The above software tools offer an indication of how other developers build their tools, in order to enhance children's learning by making visual stories. All feedback from the same genre software is quite positive in relation to both high levels of engagement and creative learning, in multiple subject areas. Cartoon films, as a part of visual stories, have some differences from other visual stories. There are other features involved which have been imported from films which can be manipulated and both character and object animations are more functional and have higher quality. Children are able to use these features to make professional stories which resemble real cartoon films. There are also more opportunities for children to develop their personal abilities, for example, creative thinking, problem solving and analysis, by exploring various film features. Nonetheless, the complexity involved also increases, in order to

be able to appropriately manipulate many of these film features. As a result, children who use software to make cartoon films are usually older than those involved with other visual story concepts. Furthermore, both teachers and children have to spend more time on training as regards the former. Software specifically designated for learning by making cartoon films is rare and the two existing tools are both aimed at multiple subject areas of the curriculum. It is argued that the design of software tools, which focuses on the single subject - Communication Skills, can be more straightforward for young children to use, whilst still maintaining the benefits of high motivation and creativity. It is notable that software for learning by making cartoon films on a single subject, that is, Communication Skills, has not yet been explored.

3.5 Summary

Few software programs were found to support children's communication development at the conversational level, while many games and tools can support various aspects of communication at the foundation level. The new MIE, with its teaching approach to film making, which has shown excellent progress regarding the making or telling of stories, may give a new opportunity to promote the development of high level communication. The summary of these storytelling software are explored in Table 3.1 and 3.2 so that it will be easy to compare them and find the differences in their features and, more importantly, how they can be associated with the process of learning communication skills and what are the differences between these software and that developed in this study. In addition, two free software programs, Storytelling Alice and Scratch, were introduced as they belong to the MIE software type and, more importantly, they are widely recognized and used by educators and researchers. As seen from the Table 3.1, most software programmes in MIE refer to their tools as

giving a stimulus to creativity and this feature is quite common. Mediastages, which is used to stimulate human behaviour for secondary children through film editing, is seen as the only one suitable for the purpose of learning communication. In this piece of software, many emotional elements can be added to a dialogue, with appropriate scene setting, to create the speaking atmosphere. This aspect seems to be associated with self-expression and with emotions in the communication process. Chapter five will further explore this issue and emphasise the connection with this study and its objectives.

		Storytelling Alice	**Scratch 1.4**	**Kahootz 3.0**	**MediaStage 2.0**	**kar2ouche**	**2Create a Superstory**	**This study**
Suggested age group		11 - 13	No age limit	7 - 15	11 - 16	7 - 16	4 - 12	7 - 11
Adaptability of Learning communication					√			√
Relevance of Learning communication	Gestures	√ (Simple)		√ (Limited)	√ (Flexible)	√ (Pose)		√ (Flexible)
	Spoken text	√	√	√		√	√	
	Record voices			√	√	√	√	√
	Choose emotions				√			√
	Speaking atmosphere			√	√ (Advanced)			
	Capture Face							√
	Design emotions							√
	Emotional topics							√
stimuli creativity		√	√	√	√	√	√	√
Main learning purpose		Computer programming	Computer programming	Visual literacy skills in a wide range of subjects	Literacy, Media and PSHE/Citizenship	Narrative and writing skills in a wide range of subjects	Writing skills	Emotional expression skills in English and SEAL

Table 3.1: relevance of learning communication

		Storytelling Alice	Scratch 1.4	Kahootz 3.0	MediaStage 2.0	kar2ouche	2Create a Superstory	This study
2D or 3D		3D	2D	3D	3D	2D	2D	3D
Main activities	Animated Stories	√						
	Storyboards					√		
	Dialogues				√			√
	Multi-purposes		√	√			√	
Animation	Characters	√		√	√	√		√
	Objects		√	√		√	√	
Scenes	Simple	√	√			√	√	
	Realistic			√	√			
	Real							√
Effects	Visual			√				√
	Sound			√	√		√	√
Others	Camera	√		√	√			
	Lighting			√	√			

Table 3.2: film features

CHAPTER 4

Educational software development

4.1 Introduction

This chapter is concerned with establishing how educational software in the classroom can be developed. Two of the more popular technologies, Computer Aided Learning and Game Based Learning, are reviewed regarding their benefits and challenges for learning and engaging. The teacher and pupil perspective of software usage in the classroom are both considered. Another feature considered is the cartoon, which as one of the more popular aspects employed in the classroom, has its educational usage explored.

4.2 Computer aided learning

The term Computer Aided Learning (CAL) is widely used to describe computer technology in education; however, CAL seems to be an ambiguous term, as there is a lack of clear definition as to what CAL comprises (LTDU, 2001). The type of CAL software has an unlimited format, and may include a game, tool, simulation, tutorial, drill and practice and hypermedia (James, n.d.). For example, games usually provide an engagement environment through learning by playing; simulations may be used in school to link theory with practice; hypermedia is able to stimulate children to think and discuss, by using graphics, audio, video or plain text. Based on the applied teaching or learning strategies, CAL software may be identified as Internet-based

learning (Cook et al, 2010), self-directed learning (Kennedy et al, 2000), problem based learning (Jasmi et al, 2010), teaching anatomy (Lu et al, 2010) and as supplementing lectures and tutorials (Shannon. 1990).

Is there any difference between CAL and computer based learning (CBL)? There is a difference, if researchers concern themselves with designed computer programme targets assisting, rather than replacing, current teaching methods. In that case, CAL may be described as using a computer programme to assist a learning process in a particular subject (LTDU, 2001; Mwanzia, 2005). CBL, on the other hand, seeks to design computer programmes which might replace traditional teaching models, to achieve a certain educational objective, without any support from other methods. The design of CAL should be a re-evaluation of the current teaching methods, to permit the developed computer programme to be able to be adopted as a part of current teaching methods (LTDU, 2001). Researchers, however, do not always distinguish the two in a balanced manner. Some researchers, for example, do not make it clear that a computer programme should be used for assisting or replacing a certain teaching strategy. For example, Adams (2004) uses CBL to describe any computer programme which might help people in learning. CAL and CBL can sometimes co-exist, thus, a large proposal computer programme, which is designed to assist in a particular subject, may require reconsidering the semester timetable, as the time cost is different in comparison to the previous teaching strategy and one or more lectures may be replaced by using the single computer programme. As a result, the overall subject teaching strategy may indicate that this computer programme is designated as CAL but the subdivided learning object may treat this computer programme as being CBL. In some other cases, the use of CBL is simply to distinguish it from non-computer

methods, there being no intention to replace anything. For example, Kroncke (2010) compares the effectiveness of using CBL and traditional practical courses in pre-clinical education.

The advantages and disadvantages of using CAL in education may not be easy to discuss in-depth, as the design of CAL software is undetermined. There are two reasons for this: one is that, as has been mentioned, CAL software has unlimited formats; for example, game, tool and hypermedia; another is that CAL in education can adapt to any age of learners, covering all subjects. As a result, the exploration of the pros and cons will be discussed from the general perspective of educational software, which shares some common features and the usage of educational software will be limited to that by children in schools.

4.2.1 Two major advantages

Basically, there are two major benefits which have been widely accepted for the use of educational software in schools:

Firstly educational software is capable of producing a stimulating learning process. As is widely acknowledged, engagement is an important aspect of learning but how does engagement facilitate the learning process? Jablon and Wilkinson (2006) explore this question from the viewpoint of psychology and behaviour. From a psychological perspective, engagement, which is driven by curiosity, interest and enjoyment, is an inner motivation for learning. An engaged learner would like to achieve their personal or intellectual goals. They would also like to accomplish their assigned task and research thoroughly, to find some inherent value. The behaviour of engaged learners

often shows concentration, investment, enthusiasm and effort. How, therefore, can educational software engage children, to facilitate their learning? This would depend on the strategies employed for engagement. Herczeg (2004) explores the experience of using a computer application which is associated with the user's mental state and concludes some interesting points regarding engagement strategies.

1. A challenging situation can engage learners. Thus, users already have some clues but they still need some skills or to take some risks, to reach a goal. This is often associated with an in-built reward system.
2. Dynamic situations can draw users' attention. A scene which contains rapid change and movement activities, such as animation, can attract users' interest, especially that of children. Even a dynamic background can encourage a user to feel that the application is 'alive'.
3. Control of the computer application can have great effects on the users' engagement (Calvert et al, 2005; Herczeg, 2004). For example, games such as racing and shooting, which use skill-based control for entertainment. Children generally prefer to control the programme by themselves otherwise they will quickly lose interest (Calvert et al, 2005). The foundation of the control system design should allow users to have a basic knowledge as to how it operates, together with immediate feedback (Calvert et al, 2005).
4. Exploration of an unknown area in terms of information and activities, can appeal to children. Children are naturally curious about things around them and like to find answers, such as why things are the way they are (Bullock, 1994). Exploration is a learning strategy in pedagogy and it is frequently used in conventional classroom teaching, such as using cards or a story to introduce a new issue for discussion (DfES. 2005). Many computer applications, either

in education or commercial games, employ this strategy to arouse user interest.

5. Blending learning content into a story can be an engaging way of learning. In the conventional classroom, teachers often use a story to set the scene and then discuss the social, emotional and behavioural issues, which are involved in the story (DFES, 2005). Story-based computer application has, however, a different *modus operandi*. According to Herczeg (2004), the design of computer storytelling should comprise four parts. 1) A dramatic narrative structure should be created to tell the story that uses short animation sequences; 2) Users should be part of the story, to encourage activities and plot development; 3) a multi-dimensional story-telling engine is required, to reflect different consequences of user's decisions; 4) Theatrical stage in a 3D environment, where users can freely move about. Apparently, computer storytelling, which brings users to experience the world in the story, may be more enjoyable than conventional storytelling in the classroom.
6. Step-by-step process learning can offer users a great sense of accomplishment because the success of each step will lead to new situations or new challenges. In some cases, experience such as knowledge and skills from each step, can be inherited in the next step, so that the experience can be constantly reinforced, not only to master learning content but also to motivate users to continue playing.
7. Herczeg (2004) emphasises that the key to maintaining high level attention and interest is to involve users in an active role. The outcome being that the design of educational software should offer a flexible learning pattern, so that users can express their own thoughts, in terms of decisions or choices, in the learning process.

Secondly educational software is capable of producing effective learning and teaching. According to pedagogy, children learn best when they are actively involved in the learning process (CCEA, 2006), for example, they can make their own plans, can review and reflect on what they have done, can express themselves with their creative ideas and can play with challenging situations. Moreover, how children learn best is also expressed in the following situations (CCEA, 2006):

- A teaching strategy which takes account of children's individual interests and curiosities.
- An engaging environment, with many accessible resources.
- A good relationship with their peers and teachers has been developed.
- Children are encouraged to take risks with their own choices and decisions.

In the UK, many of the above strategies are integrated into practice teaching plans and recommended in the National Curriculum Guidance, for example, in relation to literacy and mathematics (DfES, 2006). Teachers can directly follow these plans or take advantage of learning strategies, to develop their own teaching plans. Matzen and Edmunds (2007) explore computer technology in the classroom, indicating that it can be applied in two ways: it can support current teaching practice and it can also shift existing practice, to offer more constructive learning. Although using educational software in the classroom offers quite a different way of learning compared to traditional teaching, effective learning strategies can have much in common. More importantly, some computer technology may be able to bring unique learning advantages. Researchers have explored possible advantages of using computer technology in the classroom and are of the opinion that the following are possibilities:

‘Good educational software promotes active learning, not passive learning’ (McMullen et al, 2009). In traditional lectures, the source of knowledge is delivered by a teacher, book or broadcast and children passively receive this information (Koc, 2005). For many children, this book medium of learning lacks passion and can lead to boredom. The National Literacy Trust (Clark et al, 2008) reports that one out of three children feel uninspired and a small number of them even feel stressed or anxious. Educational software may offer a new and valuable way to motivate children in learning. For example, computer technology, such as 3D animation, may be able to create an active learning environment (Wangpipatwong and Chittrakarn, 2009); games often supply immediate feedback, employing learning by strategically engaging children to become actively involved in game-based learning processes (Ulicsak and Wright, 2010).

Roschelle et al (2000) explore how computer technology can change the learning behaviour. From the cognitive perspective, there are four fundamental features to enable the maximum benefits of learning: 1) Active engagement as has already been discussed above. 2) The use of computer technology can enhance children’s collaborative activities and encourage them to share ideas. Hence, children can learn from other’s experiences and have a better understanding of a subject. 3) Learning will be optimised if learners have sufficient opportunities to test their ideas, with immediate feedback on success or otherwise (Anderson, 1996). Roschelle et al (2000) have given many successful examples proving that computer technology, which can encourage this instant interaction and feedback, is efficient in supporting learning behaviour. 4) Computer technology is an ideal tool to translate the subject matter in the classroom to a real world situation. For example, children, no matter their

problem, can learn from exploring real problems or phenomena from the real world.

Collins (1991) reported that the use of educational software in the classroom may change the teacher's role, switching it from lecturing to coaching. Thus, teachers play the role of observer and guide, to make sure children can benefit from the computer teaching-learning process. Furthermore, teachers may begin to pay more attention to individual students, to talk with them, to understand what they have learned and to observe how they cope with problems. In traditional lecture-based teaching, teachers may feel inhibited in identifying weaker children, as the latter may be unable to give an answer, thereby embarrassing them in front of the whole class. The use of the computer in the classroom, however, allows these weaker children to have increased opportunities to receive individual help from teachers.

Many researchers have reported on the development of educational software or computer-based teaching strategies targeting specific subject areas and have indicated good performance which in some aspects have even exceeded the performance of conventional teaching. Roschelle (2000) for example emphasises that a computer-based programme which uses visualisation, modelling and simulation, can be an effective way of teaching scientific concepts. For instance, in physics teaching, Azar and Sengulec (2011) conducted an experiment to test student achievement in physics and attitudes towards physics, by comparing the usage of physics simulation software, 'Crocodile Physics' and 'Edison 4.0', with the traditional laboratory-assisted teaching method. The result showed that computer-assisted teaching was more effective, emphasising that the use of simulation software can overcome some problems in practical laboratories, such as safety concerns, equipment costs and consumption and

time consumption. In biology, Yusuf and Afolabi (2010) showed that students using computer-assisted instruction achieved a better performance than those with conventional classroom instruction and students working with computer-based learning learn more cooperatively than those working alone. In geography, Che Pee et al (2010) developed an educational game to assist teaching children about the global warming issues in the classroom. The computer assisted teaching encouraged children to explore this science and discuss it with each other. Moreover, there has been some educational focus on learner's skills and ability development, in relation to CBL. For example, Eow et al (2010), in their review findings, indicate that supporting student's creative perception can be enhanced by using appropriate teaching strategies and allowing students to become involved in making a computer game integrate with the appreciative learning approach,

4.2.2 Challenges from the viewpoint of teachers

Research indicates that computer technology can be used in many ways to support teachers teaching in the classroom. However, the use of computer technology in the classroom also stimulates many arguments, especially in relation to perceived barriers, from the teacher's point of view.

Some have the view that the use of computer technology in education will increase the educational cost because of the purchase price of the required computer hardware and software packages for school and students (Lai and Kritsonis, 2006). Some schools with low budgets and families with low incomes may not be able to afford these costs, thus, the equity of education cannot be guaranteed. Faggiano and Fasano (2008) report that a study carried out in 2004 has shown that, in Italy, 67% of teachers

reported a lack of computers and data projectors and 55% of teachers reported a lack of educational software and materials, which prevented them from using computers in the classroom. Moreover, schools with limited numbers of computers pose difficulties for teachers in appropriately managing the resources (Collins, 1991). Though this is quite an old study the more recent studies quoted above have shown that this has not been universally improved. Teachers may have to divide children into several groups, allowing each student time in different time segments and they also have to consider what to do with those children who are denied time working on a computer.

Teachers may be unwilling to give up their authority and control over their students (Collins, 1991). Teachers are the knowledge givers and many would prefer to remain as master of all activity in the classroom. The use of computer technology may, however, cause them to lose authority or at least that is what they perceive. One reason for this attitude may be that some teachers may have little computer knowledge. Another is that computer technology may supply rich information, some of which may be beyond a teachers' grasp and they may thus feel undermined. Teachers hold the attention and decide what to do with their students in conventional teaching but with the use of computer technology children may pay more heed to the computer tasks. Teachers may have to accept their role as changing from the core of the classroom, to that of a guide, observer or facilitator of self-directed learning. Again this is quite an old study and it was hoped increased use of technology would occur as more teachers had encountered the advantages of technology during their training. This, however, does not seem to have occurred.

Teachers may not be well prepared to use computer technology in their classroom, not

only because of their desire to retain authority and control over their students but also because of their negative attitude towards using technology (Hannafin and Savenye, 1993; Koc, 2005). Teachers may not wish to adapt to using technology and some teachers may even fear such usage. They may not believe that the computer can enhance learning outcomes and equally, they may lack the experience of using technology in the classroom and lack the time to train how to use technology appropriately (Corcoran, 1995; Roschelle et al, 2000). They fear that children spend too much time with computers so that the traditional printed materials will not be fully utilised, as they think they should (Strommen and Lincoln, 1992). They lack awareness of using computers, as they may be unaware of the perceived benefits of using computers in the classroom (Faggiano and Fasano, 2008). It is possible that the apparent reluctance of some may be overcome by using educational software to support teacher's professional development, although, in some cases, such training may prove counter-productive. Since many teachers may only have a basic knowledge of computing and because of the lack of information to support them in learning how educational software can be integrated into the classroom or to utilise the benefits in their professional development, reluctance may persist or even grow (Hasselbring et al, 2000). In addition, some people worry that children already spend too much time interacting with computers, rather than with people and this may affect their social skills development, thus providing support for those who may oppose the introduction of CAL.

4.3 Game based learning

Game based learning (GBL) usually, but not exclusively, refers to the use of computer games, which are software applications, for learning or educational purpose (JISC,

2007) and researchers are exploring how the motivation of the game can be successfully integrated with curriculum objectives and content (Prensky, 2003). Susi et al (2007) believe that games in education should be engaging but whether games should be fun or not is arguable, as the fun is not the only way to engage or entertain. Similar to GBL, two other terms: Serious games and Digital Game Based Learning (DGBL), are frequently used. All these applications take advantage of game features to engage the learners for a specific purpose, such as learning knowledge and skills (Susi et al, 2007). There is no clear way to distinguish them but they seem to have slightly different emphasis. Serious games concern taking the view that games are not only suitable for entertainment but can be designed for other purposes such as training, advertising, simulation and education (en.wikipedia.org; Susi et al, 2007). DGBL and GBL are almost identical, except that DGBL is limited as regards digital games (Susi et al, 2007).

Van Eck (2006) discusses games as having three ways of being used in education, these being:

Firstly, children can play roles as game designers, to create their own games. Good and Robertson (2004) believe the positive effects which can be expected to develop relate to children's narrative and literacy skills. Eow (2010) thinks this approach is able to enhance children's creative perception, however many existing toolsets, which are used to create games, are complex as they are not designed for children. Thus the redesign of toolset and game content should reflect children's needs (Good and Robertson, 2004). Van Eck (2006) does not think that this approach is appropriate, stating that, *'Even though this student-designed approach to DGBL need not result in*

commercial-quality games, it is nonetheless a time-intensive process and has traditionally been limited to computer science as a domain. It is certainly possible for modern game design to cross multiple disciplines (art, English, mathematics, psychology), but not all teachers have the skill sets needed for game design, not all teach in areas that allow for good content, not all can devote the time needed to implement this type of DGBL, and many teach within the traditional institutional structure, which does not easily allow for interdisciplinarity. For these reasons, this approach is unlikely to be used widely'.

Secondly, in many cases, GBL is felt to produce game designs which can closely integrate learning content and game play. A professional design GBL process is able to address both educational purposes and entertainment equally. Van Eck (2006) argues, however, that the GBL approach is expected to have great practical value in education in the future but progress may be difficult, as the present situation offers, '*poor examples of edutainment in which neither the learning nor the game is effective or engaging*' when compared with high quality, commercial, off-the-shelf (COTS) games. He also suggests that more good examples are required to prove that games can be an efficient way of learning, so that game design companies can be persuaded to spend time and energy on developing such games.

Finally, COTS games can be integrated into the current curriculum environment (Sandford, 2006; Van Eck, 2006). This takes advantages of existing games not necessarily designed for learning purposes but which are still suitable for use in the classroom. Van Eck (2006) thinks using COTS games in the classroom is the most cost-effective of the three ways proposed. As a result of the fact that various COTS

games can be adaptable to any subject for any learner, using COTS games will permit engagement, as the game play is designed by professional game designers and consequently its effectiveness can be expected, as the design for learning content is decided by teachers. Teachers may, however, face some challenges in using COTS games in the classroom. They would, for example, have to spend a significant amount of time to familiarise themselves with the game and may find difficulty in integrating it into a short lesson, if the game is complex or time-consuming to play (Sandford, 2006). Moreover, if the COTS game is commercial, then teachers may have to spend much time and energy in analysing how best to use it, as a commercial game is not specifically designed for teaching and a matching content is required between game and the desired learning content (Van Eck, 2006).

Besides GBL inheriting these common advantages and disadvantages with using Computer Aided Learning (CAL) applications, many new perspectives of strengths and weaknesses in GBL have been established. The following sections will discuss some researchers' perspectives of positive attributes and challenges for edutainment games being used in the classroom.

4.3.1 Possible benefits

Becker (2007) designed and taught a course for teachers to introduce digital games and their use for instruction and learning. After the course teachers, who were not familiar with games in education before, found that game literacy may enhance the relationship between students and teachers. Games are generally naturally popular among their students, even if they are simple and students seem to enjoy discussing

aspects of games and sharing their interests and experiences. Teachers and students indicated that, *'They had new things to talk about and new ways to share'*. This can be further related to dealing with students who may find it difficult to interact with their teachers.

Pivec (2007) summarises previous findings and extends them with his own experience, to explore the relationships between games and learning and investigate when and how learning takes place. A game environment offers the opportunity for players to gain knowledge through their interaction with the virtual world and furthermore, the structure of a game cycle has been confirmed as being an active learning process. Thus, game play and its learning purpose follow the learning cycle which Kolb et al (1971) describe as, 'doing, reflecting, understanding, and applying', which, *'After engaging in (doing) an activity, the learner reflects on that experience calling upon prior knowledge and experiences, develops understanding of the information involved in the activity with the aid of conceptual and theoretical materials, and finally applies the new knowledge to different activities*' (McPherson and Nunes, 2004; Kolb et al,1971). Despite the game cycle offering a new way of learning, efficient learning still depends on other game characteristics. For example, a major game characteristic is to motivate players to repeat-play a task so that their knowledge or skills will be reinforced. Hence, games should be designed with the strategy of 'persistent reengagement', to enable players to play the task again and again, thereby gaining from this repetition.

Papastergiou (2009) concluded from previous research that GBL has the potential to make the learning process *'more learner-centred, easier, more enjoyable, more*

interesting, and, thus, more effective'. Specifically, games offer a powerful learning environment in which to facilitate learning. Below is detailed how games can be used to enable learning (Papastergiou, 2009; Oblinger, 2004):

- Activates prior or diverse learning: games often require particular knowledge, to overcome a challenging situation. Problems may be resolved by applying previously learned knowledge or skills.
- Context: players should learn to understand how information or techniques should be applied and practiced in an appropriate context, to achieve maximum benefit.
- Feedback and experiential gain: feedback and experiential activities are often connected to the decision making process in which players can test their hypotheses and learn from their failure. Games thus offer the opportunity for self-assessment and self-learning.
- Transfer: the knowledge and skills learned from games can be transferred and connected to real world situations, such as problem-based learning and critical thinking.
- Social: Games can create a virtual world, which allows experiencing social practice and many social skills can be learned in games, especially multiplayer online games, such as collaboration in team-work.

4.3.2 Challenges for games to be used in classroom

On the other hand, GBL must further improve before it may become acceptable in the classroom. The challenge mainly comes from two aspects: one is how to integrate engagement with the learning process. The experience of using educational games in

the last decade has not been as enjoyable as it might have been and therefore, these GBL applications are more likely to be considered as learning tools rather than games (Van Eck, 2006). Many who believe this view do so because researchers are not trained game designers. Few of them have the high level of skills to support a comprehensive development, which may involve such aspects as game programming, action script development, art direction, audio editing, interface design, and music creation. Game designers, however, are professionally trained to produce engaging games but should also explore theories and practice of games regarding their learning goals and outcomes. A significant issue which must not be overlooked is that it is quite common that curriculum objectives and game goals are not consistent (Wechselberger, 2009; Squire, 2005).

Another issue to be addressed is how to convince teachers to use games in the classroom. '*Technology use by teachers is strongly influenced by their own attitudes towards that technology*' (Becker, 2007; Russell et al, 2003). It is true that some may resist using games as a new way of teaching, nevertheless, their personal point of views must be respected (Becker, 2007). On the other hand, it is also vital to identify and attempt to dispel their suspicions, since many of them are uncertain and thus, unenthusiastic. Some of these uncertainties are as follows:

- They would like to understand how games can improve their practice and meet the curriculum goals (Ketelhut and Schifter, 2011)
- Despite researchers claiming that some developed technologies or approaches can address particular problems, the actual usage may not be as beneficial as expected or new problems may arise (Becker, 2007).

- They would like to have a source where they can easily find out which existing games can be used effectively and for which subject (Becker, 2007). Currently, few such sources exist.
- They would like to have a convenient way of obtaining information about GBL as a new way of teaching, however, many papers are written for research purposes and are not particularly helpful for practising teachers (Becker, 2007) and not all the appropriate journals may be available or read by teachers (Sprague, 2004).
- They may have difficulty in understanding how games could be used in their classroom and few resources are available to assist teachers in designing their course to incorporate the use of games (Ertzberger, 2009; Becker, 2007). They already have a heavy workload and they have little time to learn new technology and to evaluate whether a specific game might be adaptable to their course (Becker, 2007).
- Media reports simply see games as either emancipators or *'the root of all evil'*, both views being 'justified' by their adherents (Becker, 2007). Teachers may lack confidence and would like to see what 'real' work is done. Such 'evidence' might be available from some evaluations results, which have been shared with other educators.

It should also be noted that GBL, as with any other traditional teaching method, is not universally popular and whilst some students might like a particular game, not all will necessarily feel the same (Squire, 2005). The use of games to motivate students is likely to cause two extremes: enjoyment and dislike. Some students greatly enjoy a particular game and see learning by playing the game as a perfect way of learning but

others may resist because the games are too complex, resulting in a lack of appeal. Games frequently use engaging strategies, for example, challenge and learning from failure but these strategies can have the opposite effect on some to what was intended. For example, in some cases, complexity and difficulty in games are sources of challenge and thus players can engage but others may find that games are too difficult and quickly lose interest. Similarly, the idea of learning from failure may stimulate some students to resolve complex problems, whereas, for others, it may only lead to frustration. Even if students are allowed to make choices regarding their preferred way of learning, schools must endeavour to meet the needs of all students, by offering alternatives of game-play and other traditional modes of learning, where appropriate.

4.4 Games integrated into the curriculum

(The information in this section comes mainly from a Teem report written by McFarlane et al 2002)

In order for the playing of appropriate games to be recognised more widely as an appropriate adjunct to other forms of teaching/learning, it is imperative that it can be demonstrated that the incorporation of such games into the curriculum is not only beneficial but that this would enhance the learning opportunities.

According to a report from TEEM (McFarlane et al, 2002), computer games for the classroom are usually of the simulation or quest-based genre, while other genres have not yet been identified in terms of their operational value in the classroom. The most popular commercial games are those involving adventure, racing and shooting. Children rarely play games at school and most play after school or at the weekend. Girls, it would seem, only play games when they have little else to do. In contrast,

boys clearly show that playing is often their first choice. Recent studies have, however, shown that the rise of Nintendo Wii and Nintendo DS, may well change this situation, whilst such renderings as 'Nintendogs' – a virtual dog on the DS, which needs players to take care of it, has special appeal to girls. (Klopfer et al, 2009). Most children are likely to play with someone else, such as friends or family members. Children lose interest quickly if the games are not as challenging as they expect, for example, once an adventure game is completed, few children go back to play it again.

There are several obstacles to integrating a game into the curriculum. The major obstacle is that the skill and knowledge developed by games do not match the specific skills requirement of particular subject curricula in the school system. Many games have an amount of irrelevant content, when related to the school curriculum, thereby reducing their 'learning appeal'. There is the concern that students may spend too much time relating to these irrelevant contexts, again, reducing the academic value. In primary schools, there is more acceptance of some aspects of little content relevance but secondary schools cannot afford to waste time and have more consideration for the effectiveness and significance regarding subject knowledge and relevance. Teachers need to recognise the learning content of games and associate it with lesson plans before they use games in the classroom. Teachers, however, might have to spend more time than they wish recognising learning activities from games, as a better way might be to experience play, especially when more time is required for complex games. A review of games and learning report (Kirriemuir & McFarlane, 2004), stated that, *'neither teachers nor parents were happy with the notion of playing games in lesson time since such skill development did not match the criteria assessed in high stakes national tests'*.

Main suggestions regarding games design for the classroom

During a game session, teachers want to know the group's achievement for record purposes. Thus, if games can supply some feedback during or after games, this will help teachers to have a clearer understanding of the achievements of all involved. The form of feedback can be scores, time spent, task comments or anything else which can be used to show player achievement.

It is better for the content of games not to deviate too far from realistic models, otherwise the educational value of games will more debatable. For example, 'magic power', is not appropriate in a factual learning context. The content of a game should also be accurate, which means that algorithms constructed in the game should follow the rules of the real world, for example in simulation games – such as race tracks and flight simulators. If this can be made clear, then, teachers may become more confident in using the game for teaching purposes.

An important feature of the game is the 'saving and restarting' function. Teachers want games that can be saved on time, after the lesson and to quickly retrieve the finishing point for the next lesson. Another consideration is that children should play a game with a specific partner during a lesson; the game is saved after this lesson but the partner changes in the next lesson and thus the design of games should provide a solution to combine partner records, for restarting the game.

Games for school are not suggested as having a lengthy playing time. If a single task requires excessive time, the design team should consider adding a stop point for resumption next time. Games for home use can, however, be designed to be played for a longer time, without interruption, as the time factor is likely to be less pressing.

Children play games with other people; they discuss the problems they meet and the strategy they will use. During this process, a skill termed, 'collaborative problem solving' will be developed and this skill has been recognised as having an important educational value by parents, children and teachers.

Children can reinforce some skills or knowledge by repeated practice in games, thus, it is valuable to maintain children's interest by games supporting a "non-identical" repeat function.

Children's favourite games often have appropriate challenge levels, with multiple level divisions, therefore each can see the process evolving.

Children's comments on game design

Children enjoy making decisions in relation to some actions they use in games. For example, in action games the hero can use their army to hold energy in preparing to attack; the longer held, the stronger the player becomes but enemies also have more opportunity to attack you. As a result, children have to make the decision as to when the hero releases the power to attack.

Some children think it is helpful to have some knowledge acquired from the real world when involved in game playing. For example, with a racing car different types of tyres are used for different road conditions, such as freezing temperatures, desert heat and aridity and mud on the road. TEEM reports that these features are still rare in educational games.

The Teem report found that, *'Within the educational context, many of the game elements are concerned to ensure that the tasks are small enough to give success when pupils leave their turn at the game'.* The use of small tasks is not as important as game developers might think, on the contrary, using very small tasks makes it more difficult to set challenging content. Children's comments have confirmed they are much more concerned with the challenge from games, than with immediate success. Many parents and children also think it is important to allow the opportunity for children to think of the strategy in home play, when they are outwith the game environment, thus allowing them to make plans for their next attempt. It is thus clear that it is difficult to set a very small task which is complex enough to satisfy the children's needs.

Additional guidelines:

- Games should provide support documents to guide teachers as to how the content might be used in class, which would be very helpful for teachers in integrating the game into lesson plans;
- It is better to design navigation in the main menu, in order to allow players to quickly access a few significant parts of the game;

- It is advisable that no text input is required, especially in games for young children. If games need to show some information in text format it is important that the reading age of the text should match the target age group.
- The control of background sound should be provided, as it is difficult to use appropriately. For example when children start to discuss in pairs it is inappropriate for there to be a significant amount of distracting game noise.

A friendly, children-centred user interface should be used, which is easy for children to use.

4.5 Children and cartoons

Children enjoy watching cartoons on television and many of them watch regularly (Atwal et al, 2003). Children of different ages usually have different needs in terms of the design of cartoon characters and the content of a cartoon story. Bielli et al (1997) divided children into two age groups, in order to explain their needs, in accordance with their preferences as regards television programmes. Children aged from 6 to 9 years old prefer fantasy characters such as animals, with simple emotions, as well as fantasy stories with simple adventures. Children aged from 10 to 12 years old prefer anthropomorphic characters with more complex emotions and they also like fiction with adventure, as they have begun to use 'abstract thinking'. The choice of cartoon preference is also affected by gender. *'Girls seem to prefer characters that express love, gentleness, kindness and humour, while boys prefer those which convey adventure, risk, competition and combat'.* (Bielli et al, 1997)

The cartoon concept is closely associated with children's everyday lives (i.e. story books, card games, toys, televisions, video games, etc) so that many people, including

parents, teachers and child-related institutions, are concerned as to how cartoons may affect children mentally and influence their behaviour. Cartoons have some acknowledged positive effects and these are considered as key to attracting people to consider using a cartoon-based learning strategy for teaching and learning. Such effects include (France, 2008): 1) Cartoons used to engage attention; 2) Cartoons for entertainment; 3) Cartoons as a non-threatening medium; 4) Cartoons to stimulate children to discuss and debate and also encourage the thinking process. These effects are reflected in some examples in practice.

Cartoons can draw attention effectively as, *'they are familiar, can exaggerate events and can reveal many facts at a glance' (Philippe, 1980)*. Atkins (2005) says using cartoon characters to make a presentation can attract audience attention and furthermore, there is more likelihood of the audience remembering the core information after the presentation. Many companies use cartoons for commercial purposes, an example of this being the Japanese cell phone, 'Hello Kitty', which shows that cartoons can draw the attention of potential customers (Entrepreneur, 2002). In pedagogy, teachers also see cartoons as a good way of engaging children's attention in the classroom. Dalacosta et al (2009) found a most innovative use in the instructive practice, which is where cartoons first capture students' attention and then encourage them to become involved in mind exploration and entertainment while they are learning. Chemistry teachers, for example, use cartoons in their classroom. Although the reasons for using chemistry-based cartoons are various, one important reason is that *'Cartoons have the power to both draw attention quickly and come to the point' (Roesky et al, 2008)*. An element of humour, which is sometimes introduced into cartoons, can also increase attention and interest and provide the motivation for

learning (Doring, 2000). Using humorous cartoons has been tested and proved to be an effective way of creating a learning environment, when, for example, teaching about mineral and rock concepts (Rule et al, 2005).

'(A)… cartoon might make you laugh, but its main purpose is to make you think. These cartoons often comment on political issues. Like funny cartoons, political cartoons exaggerate and use symbols to make a point. (Fast Tracks, 2009)'. The above shows that cartoons can introduce a way of learning through fun. Playing is an important part of childhood and evidence shows that playing is valuable for children's learning and development. Many educational games, such as children's games on the BBC Schools website, are designed with cartoon styles, as cartoons can create a flexible learning environment which can, *'promote enjoyment and achievement and thus motivate children to persevere in learning' (DCSF, 2008);* For example, mathematics cartoons which put mathematical theory into cartoon animation tiny games, can help children learn the abstract concepts of mathematics. Janna (in Lander 2006) says if children enjoy this cartoon style animation they will remember the visual images and hence the mathematical concepts referred to, which they have already learned, will also be more readily remembered. (Many mathematics-based cartoons can be found on the Maths-Whizz website http://www.whizz.com/.)

School teachers and researchers see the cartoon as representing a non-threatening manner of teaching (Andrew, 1997; Doring, 2000 & Atkins, 2005). For example, Doring (2000) suggests that cartoons with a humorous element can minimise, or at least reduce, the possible harm resulting from verbal humour in a direct teaching model. His reviews found, however, that the use of verbal humour or its overuse can

bring the risk of undisciplined and flippant teaching and also the *'Experience of verbal humour suggests that delivery is a real skill, not all students will be attentive and understand while there is the risk of offending through misunderstanding with any joke being perceived as a serious of ridicule, sarcasm or as being racist or sexist.' (Doring 2000)* Furthermore, Weiner et al (2002) suggest that the cartoon is a non-threatening way of resolving students' social skill problems which they may be experiencing. They introduce a method where teachers find an appropriate cartoon in which a social skill problem may appear and this allows the teacher to guide students to resolve the problem through a discussion of how the cartoon characters may respond to each other.

Cartoons can be useful in stimulating students to discuss and debate in the classroom. Cartoons, especially political cartoons or cartoons with social comment, can powerfully reveal the contrast between perception and reality (Doring, 2000). Students enjoy the challenge of analysing the elements of cartoons (examples being symbolism, visual metaphors, perception, exaggeration, stereotyping). Teachers may associate cartoons with important educational concepts, so as to enable students to discuss and debate in order to let them better understand the teaching content. During this process, 'teachable moments' may provide opportunities to teach further (Ostrom, 2004). The design of young children's learning activities often uses cartoons as stimulus materials. For example, the 'TalkDog Comic' (Better World Campaign) is designed to stimulate debate and develop children's communication skills. This cartoon style online resource has been evaluated in the classroom and the results show that it provides strong motivation in stimulating children to discuss and debate (see Section 3.2.2) There are many children's games based on cartoons attempting to

stimulate discussion, such as ‘podd’, ‘Sherston Skill Builders - Identification Skills’. More examples can be found at http://teemeducation.org.uk.

4.6 Summary

This chapter provides a detailed review concerning the software development issues relating to engagement and effective learning in the classroom, the first being concerned with how software can be developed for classroom use. Many positive and negative impacts of using game-based learning and computer-aided learning have been explored and comments from teachers and children on software-design aspects for classroom use are highlighted. Moreover, most educational software prefers cartoon-style designed products and the reasons given for how it can support teachers in the classroom have been discussed. Some of these engaging and effective learning theories will be connected to this study, to support the development of the film production tool and the detail will be discussed in the next chapter.

CHAPTER 5

Tool design

5.1 Introduction

The exploration to date of Computer Aided Learning to assist children in learning interpersonal communication is very limited and little of the previous work gives any indication of how such a software programme can be developed. Fortunately, the recently raised issue of using the filmmaking approach in Moving Image Education has given some hope that children may be able to practice their communication skills when they are asked to produce a film. They can be involved in the key process of making character animation during the filmmaking and their thoughts, choices and personal abilities, such as those relating to speech-voice, can have a significant effect on the end product. The basic requirement for filmmaking is to complete the essential functions in order to produce a film. Furthermore, these functions should serve to assist in the teaching of communication skills if at all possible.

This chapter explains the theory, design and implementation, of such a software tool. This involves the core learning theory and other supporting aspects, which are likely to benefit the tool design. Many of these theories evolve based on previous work in Moving Image Education (See Chapter 3) and the summarised experiences of educational software development (See Chapter 4). The design under consideration will integrate these theories through the filmmaking approach and attempt to increase value for the tool's potential for classroom use by integrating the teacher's view.

Finally, the implementation introduces children's use of the software tool process.

5.2 Theory

5.2.1 Theory for learning

Character animation in a cartoon film has a close relationship with actual human behaviour and as a result there is the possibility that watching cartoon films may help pupils to improve their communication skills. Merely watching a film, however, does not seem a particularly efficient way of seeking communication improvement. Children's responses to viewing films is simple, such as, 'this is a fantastic film', 'I liked the bit where…'. A report (BFI, 2000) from the British Film Institute (BFI) has explained this issue.

Films have their own complex and unique language and even children can 'read' films although they may not be sufficiently aware to link what they see with their own skills. BFI has developed a special teaching method to enable children to learn by analysing films such as, 'Freeze Frame', 'Sound and Image' and 'Spot the Shots'. Take 'Freeze Frame' for learning communication as an example. When a film is playing, the action can be stopped (by 'freezing' the frame) and then the children can discuss such matters as: what are the characters' expressions in the image? What is their appearance and gestures? Sometimes, the same expression or gesture may have a different meaning because of the different context, which can be hard to explain in words but a sequence of images may express this much more clearly. The BFI also refers to this teaching method as being more than just learning communication, as it can cover a wide range of aspects of the curriculum, such as English, history,

geography, citizenship, etc.

Learners can be put in the position of the animator, in order to learn communication techniques. In, ‘Acting for the Animator’, Ed Hooks provides an acting theory for animators, relating to character animation in films (Hooks, 2003). He has explored the connections between thinking, emotion and physical action and has shown how to enliven a character. Cartoon characters in films have some common characteristics. The audience recognises the characters’ personalities, understands their thoughts and perceives their feelings, as a result of the character’s body language, facial expression and spoken words, allowing understanding of what the film wants to say. In order to deliver strong emotions animators must consider more aspects than are seen by the audience. For example, if the audience sees that a character is angry, are they concerned as to how the character’s eyebrows move? Most audiences do not consciously notice such details, thus the extent of the benefits gained from the perspective of learning communication skills by merely watching films or playing simulation games should be questioned. Conversely, if the learners are placed in the animator’s position, a major goal for them is to create empathy with the character, as well as with the audience, to allow emotional contact with the characters and identification with them (Maestri, 2006). The animator frequently uses exaggerated body gestures and facial expressions to indicate emotions (Sullivan et al, 2008). Thus, the design of character animation in a film requires learners to fully examine the nature of communication skills and then apply these skills in a deliberately exaggerated fashion. Normal speech often includes non-verbal cues and they play a significant role in demonstrating feelings and relationships. Some important non-verbal aspects, such as gesture and facial expression, are fundamental skills for

communication (Martin et al, 2009). Learners, as well as animators, have to know how to take advantage of these cues, so that their designed character animations find empathy with the audience.

The above are two theories for teaching children communication skills by using films. The British Film Institute (BFI) mainly supports the teaching method focussing on the former theory, whereas this study mainly focuses on the latter. It should, however, be appreciated that as regards the teaching method being considered in this study, it is more than just the utilisation of a tool to make films, as it also asks children to comment to each other and there is significant value placed on receiving feedback after children view the films.

5.2.2 An exploration of building an e-learning environment

A team from the University of Milan-Bicocca (Realdon et al, 2006), proposed building an e-learning environment where users can gain experience in communication skills by the interaction with a non-player character (NPC). In the e-learning environment, the interaction between users and the NPC is a narrative structure, which tries to replicate real face-to-face communication. Users are given a list of choices at each turn to express their perspective, to which the NPC reacts according to inbuilt pre-scripted perspectives. Hence, the user can clearly observe the different reactions of the NPC to different choices, some of which lead to the successful completion of a mission, others leading to failure. During this process, the user gains experience through comparing their perspective and the reactions of the pre-scripted perspectives.

Many challenges to such an approach are evident. ‘Meaning’ in communication is highly flexible and adaptable, thus the same word can have a different meaning in a different context, according to the use of different vocal emphasis or being accompanied by different expressions and gestures. In addition, when people speak, their language displays certain patterns, these possibly being determined by their personality and experience. To allow for this complexity in the communication process, an interactive simulation system should allow users to express their thoughts with some degree of freedom, as well as the user having a large number of choices. Choice cannot be unlimited, however, as excessive variety would unacceptably prolong the process. Another problem is that there are no existing algorithms or predictive models, which can be used to anticipate the behaviour and reactions in the complex communication process (Realdon et al, 2006).

5.2.3 The usage of cartoons

As discussed in Section 4.5 – Children and Cartoons – the employment of cartoons in the classroom has been explored and this section will explain how these features are utilised in this tool, as well as how cartoon characteristics can be used to benefit children when learning communication skills.

The previous discussion in ‘Children and Cartoons’, has shown that children from 5 to 10 years old would be better at understanding emotional cues when using fantasy characters with simple emotions, as most prefer this style. The tool, however, prefers characters to be anthropomorphic, as well as the character being of human appearance, with refined models, because the model within this level can ensure that

cartoon characters can easily mimic real human behaviour and emotions. In addition, anthropomorphic characters appear to be more challenging to develop and therefore maintain interest and enjoyment, although in a different way.

The previous discussion also emphasised that if cartoons can attract children's attention, they can remember the visual images and this also encourages them to explore more deeply. By the use of this filmmaking tool, which is already known to be a creative way for encouraging self-expression, it is likely that children will be further encouraged to involve themselves in the creative process. For example, in the facial expression design system children can freely design their personalised facial expressions. If they find their designed expressions are enjoyed by others and make them laugh, this will encourage them to progress further. Along with this process, their previous acquired knowledge and skills will be recalled, practiced and extended.

Communication is not always a simple skill to acquire and yet a lack of appropriate social skills or communication skills can sometimes be recognised as being inhibiting to progress in life. Children who have had little previous language experience can sometimes use inappropriate ways to express their ideas, feelings and thoughts. Using the filmmaking tool which uses cartoon characters as their representative can make the communication process more achievable, as well as allowing children sufficient time to consider the language, expressions and gestures they regularly use. Even though children may express their thoughts in an inappropriate way, others may not necessarily be offended, as this is an indirect communication process and cartoon characters appear to be fun and humorous, which is seen as being less threatening. This is also the reason why people often use cartoons for a variety of purposes, as it is

perceived as being a non-threatening method of communication.

A comparison between a cartoon character and a real person would normally indicate that the cartoon character often employs many simple and direct strategies to empathise with their audience. One commonly recognised strategy is to use exaggeration, which often appears in story plots, actions and expressed emotions. This exaggerated behaviour will bring strong visual and emotional impact when compared with real life behaviour. This explains why teachers may prefer to use cartoons for certain teaching purposes, as they can attract children's attention and come quickly to the point. Utilisation of the tool in filmmaking assists children in reaching decisions regarding what they think is important in the communication process and many tactics can be used to create empathy with their audience. For example, some children focus on speech characteristics, such as tone of voice and the spoken word but others may emphasise the characteristics which form facial expressions of emotions. Theoretically, the tool design is not concerned with how to precisely mimic physical behaviour but rather to let children experiment with their creative expression and the results can be tested by seeing how an audience responds to their characteristic communication skills. By using cartoons these characteristics are easy to detect and therefore can easily be analysed.

5.2.4 Effective learning in the classroom

Using the filmmaking strategy can bring some unique advantages to support effective learning. Many of these advantages have been introduced in Chapter 3 but they can be further associated with the psychology view as expressed in this study, which are summarised as follows.

Effective learning is not concerned with how much of a concept has been taught but with how much can be constructed with their own meaning (Rutherford and Ahlgren, 1990), as well as seeking answers, rather than struggling to simply remember (Cherry, 2010). The filmmaking process has proved to enable children's creativity. That is, it has enabled them to express their creative thoughts through film production. During this process, children need to connect their new ideas with their existing knowledge, so that these creative thoughts can be tested in real conditions. If ideas only exist in the mind there will never be the opportunity to learn how good ideas can be and how they can be improved.

Some may think that many practical activities in school might well reach similar learning goals without the use of a computer and this can be the case. The aforementioned practical activities can, however, have their limitations in relation to children's performance. For example, they can suffer from conditions such as shyness, nervousness, unhappiness, fear, etc. In the current circumstances such pre-existing conditions can be difficult to alter, as the causes may be associated with personality, relationships and family condition. Filmmaking is, however, a less sensitive exercise and cartoons offer a less threatening environment, which allows children a comfortable environment in which they may feel more inclined to speak. As a result, filmmaking can be a good supplement to practice activities, to encourage children to enjoy effective learning.

According to Rutherford and Ahlgren (1990), *'Young people can learn most readily about things that are tangible and directly accessible to their senses—visual, auditory,*

tactile, and kinesthetic. With experience, they grow in their ability to understand abstract concepts, manipulate symbols, reason logically, and generalize'. Filmmaking uses a range of settings such as audio, scenes, stories, animations and other visual aspects. This not only encourages children to learn to visualize but also develops their ability to analyse and understand the significance of what they see every day.

The knowledge will be better understood if students learn through multiple media. Psychology offers the view that: *'The more regions of the brain store data about a subject, the more interconnection there is. This redundancy means students will have more opportunities to pull up all of those related bits of data from their multiple storage areas in response to a single cue. This cross-referencing of data means we have learned, rather than just memorized.' (Willis 2008)* Filmmaking apparently offers a different learning style in comparison to conversional teaching activities in school. If filmmaking were to be incorporated in the current education system it could enrich the current teaching activities in satisfying children's individual needs and also permit more learning diversity, as children would be able to explore issues using different approaches, thus reinforcing their learned knowledge.

By considering another aspect, theoretically, filmmaking is seen as an effective learning strategy but the potential learning enhancement depends on how the tool is designed, how the tool is introduced to teachers and how the tool is used in the classroom. In the tool design, theories of time, cost, efficiency and curriculum relevance have to be considered as vital aspects for effective learning in the classroom and this detail can be seen in Section 5.3.2. Furthermore, teachers need to have a good understanding, both as regards the usage of the tool and the goal of this study, before

they introduce it to their students. Their understanding will directly influence the arrangement of the experiments as they know what is best for their students and classroom teaching but they may be unsure about the computer usage. Creating experiments to test the use of this tool for effective learning needed teachers and the researcher to work together to create a practical and effective plan for the classroom teaching. Such a plan is introduced in Chapter Six and was used in the experiments, the results of which are analysed in Chapter Seven.

5.2.5 Age group

Children of different age groups usually have different requirements regarding the design of software and more importantly, as they grow, their understanding of communication skills and their learning objectives are constantly changing. In this study the tool design targets children in their primary years. This section will explain why this age group is appropriate.

Early communication development is crucial and Chapter Two has revealed a series of problems arising when children fail to develop their communication skills. One significant problem is that language delay becomes common among young children. Several research studies report that around half of children entering school experience language delay. Language delay is the expression used to describe children who are not learning at the expected rate but it also indicates the possibility that these children may eventually catch up with their peers (David Newmonic Language Resources, 2012). Indeed, for some children, this language delay is temporary and many catch up unwittingly but others may require this problem to be appropriately addressed, otherwise their communication skills may deteriorate. Underdeveloped

communication skills can continue for a long period, even into adulthood and as a result those affected may have their social life and academic achievements negatively affected (See Section 2.6). Moreover, professionals also emphasise that the early stage is key in both the identification and intervention for children with communication difficulties. In fact, once children have been identified as having communication difficulties the intervention will be long-term and complex, as multilateral cooperation is required from teachers, parents, SLCN specialists and other children-related workforce members. Thus, the optimum outcome is more likely to be achieved by providing appropriate support for children in the early stages of their communication development, especially those around the age of 5 who will experience a better opportunity to make progress when they move from pre-school into primary school.

As mentioned in Section 5.2.1, the proposal is that children will be put in the position of an animator to design character animation for a cartoon film and this inevitably requires some knowledge of character animation and film language. Most children spend a great deal of time (3hours per day) watching TV/films (Ofcom, 2008) and nearly one in five children occasionally use TV/film to discuss the media effects (Marsh et al, 2005). Thus, it is possible that children have already learned some film related knowledge when they enter primary school but what is unclear is whether this knowledge, plus some training, would be sufficient for children in becoming competent in filmmaking work. It is felt that 5-year-olds offer a suitable starting point to examine this issue. On the other hand, the available tools to involve a filmmaking strategy in education have been shown to have the capacity to cover a wide range of age groups. For example, Kahootz3.0 is suggested for children from 7 to 15 years old and MediaStages also refers to covering Key stages 2, 3 & 4 in their Teacher Support

Pack. In addition, in the National curriculum for England, – English subject (DfEE & QCA 1999), the requirements have clearly shown that learning communication is gradual. For example:

- ***Key stage 1****: To speak clearly, fluently and confidently to different people*
- ***Key stage 2****: To speak with confidence in a range of contexts, adapting their speech for a range of purposes and audiences*
- ***Key stage 3 & 4****: To speak fluently and appropriately in different contexts, adapting their talk for a range of purposes and audiences, including the more formal*

This would seem to indicate that a tool deemed appropriate for Key stage 1, may be adapted to Key stage 2, in addition to tools or teaching approaches for learning communication, which are likely to extend to include older children.

In general it is reasonable to assume that young children and their appropriate development should be considered as a high priority. This tool is designed for primary school children and although this age group encompasses a wide age range, in relation to supporting their learning communication skills, this age group is considered to be an appropriate target population.

5.3 Teachers' role in the tool design

In Chapter Four, teachers' comments regarding educational software have been discussed. Debate concerning the merits or otherwise of tools and games to be used in the classroom is ongoing, which is unsurprising as educational software does not purport to be a panacea for all learning. When it is used to address some problems in education new problems may rise. For example, many tools and games are able to

make learning fun so that children are actively engaged but many may also fail to make learning efficient and be adaptable to classroom use.

The research interest of this thesis targets making learning enjoyable but the cost for this is that an educational software programme often has to introduce much irrelevant information, in order to maintain children's motivation. As a result, teachers may appreciate that educational software can appeal to their children but are concerned as to whether these educational programmes are suitable for classroom use because the teacher's duty is to ensure that their children can meet the national curriculum requirements, within the scheduled time. Many other comments and concerns have been discussed in Section 4.2 and 4.3. These teachers' view points must be respected and their concerns must be addressed. However, the development of educational software is still in its infancy and many problems need time and practical study to suitably address. Some of the issues can be addressed through appropriate software design, which may increase teachers' confidence in using educational software in the classroom.

5.3.1 Initial approaches to designing the tool

At the beginning of this research study a research proposal was developed which intended to use character animations to help children in their learning of communication skills. The software was made but further development was required to gain a better understanding of:

- How communication skills are taught in the classroom?
- What kinds of problem are met when children learn communication skills?

- What teachers think about using character animation to enhance children's capacity in learning communication skills?
- How do teachers expect Computer Aided Learning to help them?

To address these questions, several meetings were arranged with teachers to discuss educational software and children learning communication skills. They talked much about what students have done in their classroom such as, in the circle time, students were asked to smile and say 'Hello'. Some teachers also emphasised the relationship between teachers and students as being key to success but they rarely talked about using computers and appeared generally to know little about how computer programmes may help in the learning of communication skills. They agreed that character animation, such as cartoon films, may help children in some ways but indicated a lack of previous experience in this area. When asked to identity any problems which they had met, they indicated few problems in their conventional teaching and they confirmed never having used computers in the teaching of communication related subjects. It was thus realized that it is unwise to directly ask teachers to identify potential problems or suggest possible innovations in their classroom. After all, the conventional teaching method has developed to become a mature system and teachers, based on their experience, often feel that they already have suitable methods for dealing with different problems, whereas computer aided learning is still a novelty to them.

As a result, the strategy was changed to that of observing how teachers taught their students regarding the subject of SEAL and how students responded to this conventional teaching in the classroom. The researcher took the view that the design of character animation in filmmaking has been found to have value, which can

support children in practising communication skills in a virtual environment. This idea was then translated into a simple software demonstration and discussed with teachers to seek their comments. In fact, teachers are generally happy to consider ideas from the computer field and are prepared to give comments as to whether these learning theories and software demonstrations might be appropriate for their students. Furthermore, many of their suggestions helped to extend the ideas and improve some functions of the tool.

5.3.2 Influence from teachers' own attitudes

The design of the tool should acknowledge teachers' own attitudes towards computer technology, as their beliefs greatly influence the usage of educational software in the classroom (Becker, 2007; Russell et al, 2003). Section 4.2.2 has revealed the fact that many teachers are not well prepared for using computer technology for various reasons, for example, they fear that children could spend too much time on the computer, thus traditional printed materials would be less utilized; they may not believe that the computer is able to help students improve learning outcomes; they are used to their traditional teaching methods and are unaware of the possible benefits of using computers in the classroom. Obviously, these personal perspectives might prove to be an obstacle preventing a software tool from being used in the classroom but in addition, many teachers seem to have no intention of trying to introduce computers to the classroom, perhaps because they feel threatened by the possibility. The key question is how to encourage teachers to appreciate the value of a software tool.

Both Computer Aided Learning and Game Based Learning have been explored in Sections 4.2 and 4.3. Two common advantages, which are engagement and effective

learning, have been frequently referenced because researchers believe these two features are the key to enhancing some learning behaviour. Thus, these features need to be vigorously promoted in the design of educational software. Teachers may indeed appreciate these features but are often more concerned about the curriculum value in the practice situation, for example, they would like to know how a computer programme might help them reach the curriculum objectives. To address this concern, time, cost efficiency and curriculum relevance have to be optimised, in order to better serve teachers' practical needs.

The design of the current tool considers time and the cost efficiency of its usage in the classroom. On the UK BBC School website, many tiny games have been offered and they have simple rules with easy manipulation, so that even those without previous experience can understand and use them. When considering filmmaking, however and the use of the proposed tool therein, the situation is more complex. For example, Kahootz3.0 and MediaStages, which are also used in conjunction with the filmmaking process, are not only complex in terms of technology but also require a knowledge of the language of film. As a result, to use these educational programmes often requires developing a long-term plan. The latter initially involves some training courses and then the teacher gradually learning the essential skills of filmmaking, until those to be involved can fully understand how to use the tool to produce a film. The result is that, if teachers would like to add these educational programmes to their classroom teaching they may have to make a major decision because these programmes will take many school hours, such that altering the semester timetable is often required. Thus, these educational programmes require to be significantly integrated with the curriculum learning rather than simply being viewed as assisting teachers with their

teaching.

The current situation reveals, however, that many teachers, as discussed before, lack the confidence in using educational software in the classroom, hence a software tool, which require teachers to invest a lot of time to make a major innovation will become less appealing to them. By committing themselves to an as yet untried concept, they fear they may find themselves significantly disadvantaged and furthermore, their trusted conventional teaching methods may suffer. This research study avoids this problem by emphasising that the usage of the tool should play the role of assisting and the filmmaking process should be suitably simplified, whereby teachers can easily integrate the tool into their conventional teaching. In addition, their fears can be allayed regarding the importing of the tool having a negative impact on their regular teaching. To achieve this goal the filmmaking will incorporate the following in the tool design:

Firstly, the tool does not intend to require editing of the scene and setting the lighting and camera. Although these functions may be able to create atmosphere and supplement plots for the story, they require spending a large amount of time understanding and learning how to use them properly, yet they play only a modest role in the objective of learning communication skills. Nonetheless, the tool does offer a simple option to choose the location of a conversation from a range of environment scenes, this being due to the feedback from teachers and children who have shown that they are interested in discussing where stories take place.

Secondly, the tool can only be used to produce dialogue-based films in which two

players will have a face-to-face conversation at a specific location. Filmmaking offers users a platform to express their creative imaginations and produce evidence of them in a film. These creative imaginations often contribute to the different parts of the filmmaking process, such as visual effects, sound, storylines and character animation Dialogue-based filmmaking tries to focus the creative activity on the learning of communication skills so that learning can be more purposeful and the amount of time spent on filmmaking can be reduced.

Finally, the gestures and postures for character animation are pre-made and not designable. During an experiment, one child once asked if they could design their preferred actions, in the same way as in facial expression design. Some children seem to be dissatisfied with the gestures and postures the tool offered as most actions are designed as a type of norm and there is no way for children to make their own personal actions, despite this being potentially enjoyable. The reality is, however, that even for adults it is difficult and time-consuming to design an action in a 3D space. However, this aspect is worthy of further exploration in the future, as everybody is unique so they should be able to express their unique perspective.

The design of the tool takes account of the curriculum relevance as well as the knowledge and skills developed by the tool, so as to be able to enhance the pupil's ability to master the subject curricular in the school system. According to the report from Kirriemuir & McFarlane (2004) concerning games and learning, the main problems inhibiting the appeal of games in the classroom relate to the fact that game-developed skills and knowledge do not match the specific requirements of a particular subject and teachers are concerned that games have too much irrelevant content,

resulting in students having to spend much time on them. To make this tool professionally suitable and valuable for teachers, it is necessary for educational content supplied by the tool to address two concerns: subject oriented and course oriented. The former is to decide the subject for which for the tool is to be used.

Section 2.3 has indicated that communication skills are demanded by almost every subject in the primary school, as they are thought of as being cross-curricular skills but the Social and Emotional Aspects of Learning (SEAL) (which are associated with a statutory subject - Personal Social Health & Economic education) and English, are considered to be the most relevant subjects for the purpose of learning communication, as both offer plenty of opportunities to analyse how to be a good communicator. In English, this subject is concerned more with English foundation skills writing, listening, reading and speaking. In SEAL, emotional literacy is taught and the subject explores the types of problem children may face when they grow up. Comparing both subjects, the tool will be more advantageous to use in SEAL because the self-expression concerning feeling and emotions plays a major role in the usage of the tool. The course-oriented aspect is to ensure that the tool is designed to fit the themes of some specific courses. Initially, the tool design offered pre-made dialogue scripts, based on dialogue from children's familiar story books and children are expected to act them out by using the tool. These pre-arranged dialogues, however, do not seem to satisfy teachers, as they have their own structure. In a practice study, the SEAL teacher displayed the timetable for the coming semester and suggested the theme of 'relationships', which is a major theme from the national primary strategy. Under this theme many topics are available and it is for teachers to decide which topics will be used. Around one week before the experiment, the teacher indicated the

selected topics. This teacher's preparation process revealed the fact that the design of this tool should mean it is able to adapt to the changing topics and themes and it would be better if it allowed teachers to choose the topics in the tool.

5.4 Tool design

The whole design process contains two major purposes: Design for film production and Design for education. The former purpose is to ensure that children will experience the whole process of film production. The result is that the foundational functions and steps for film design must be achieved. For example, any conversation in films must contain speech, thus the tool must provide a speech system and as any speech must include lip-synchronisation, the tool must provide mouth shape animation on the 3D character and ensure it synchronises with the speech. The latter purpose is to express its educational value through designing with various approaches, for exammle, each step of film production was specially designed to embody its educational value; Interface design was there to adapt to children's needs and more extended functions were there to enhance the educational value.

5.4.1 Overview of the film production

In industrial film production, a cartoon film can involve different techniques but generally follows a basic production scheme. A software tool which targets developing children's learning behaviour by making cartoons, usually involves this basic process as its guideline. It is challenging to design any cartoon film as it involves a range of professional/technical knowledge, encompassing modelling characters to visual effects and from camera movement to story plot arrangement.

This, however, also leaves significant scope for developers to have vision and to bring in their own creative ability in order to make a quality film which educators feel would have pedagogical value (BFI, 2003). In practical animated film design the work is demanding, with a group of skilled people being involved. It is difficult to develop even a short film without the involvement of others. For children it is necessary to make the whole process simpler; otherwise, they have neither the time nor the skills to complete such a project.

Tools such as Kahootz3.0 and MediaStage, use pre-defined materials, characters and animation. The creative work exhibited reflects how children make choices in combining these pre-defined resources, to produce a film. The current software inherits this feature and uses an automated process to generate an animated film, with children being primarily involved in the key aspects relating to character animation and design, while the tool manages the other aspects. Designing the character animation is also based on a high-level operation, to reduce the complexity and required professional skills. Thus, children can produce a film in a very short time and with minimal specialist knowledge and skills.

An initial prototype was developed based on these principles:

- The interface should be easy to use.
- There would be choice of animation for common body language.
- There would be a simple mechanism for creating facial expression.
- Facial animation could easily be linked to the voice.
- Players could record their own voice for use in the cartoon.

The initial prototype was tried, in order to integrate the process of designing animated

films as a game structure. The quality of designed animated film depended on the players' knowledge and skills as regards the communication process, while game elements were used to motivate children playing and learning through designing character animation. Unfortunately, a game which supports players in freely controlling the character's verbal and non-verbal behaviour obstructs feedback. A major reason for this lies in the technical aspects, there being many meaningful signals related to emotional behaviour but current computer technologies are not yet able to provide feedback based on computer autonomous judgment, such as accuracy in recognising the emotional element in a recorded voice. Another reason relates to the complexity of human psychology, which leads to a lack of specific rules for recognising meanings and emotions relating to movement and actions (Realdon, 2006). A game without feedback cannot readily be considered as a game with potential educational benefits, with feedback also being a key part of the learning process in pedagogy. In order to provide feedback the software was designed to be used by pairs of children, so that one could give suggestions to the other and also receive feedback from other children, teachers or parents. A further solution could be to build a school network platform where children post their creative work and discuss and comment on each other's work.

Learning communication skills is a long-term objective. It is, therefore, important to ensure that children are able to reinforce some skills or knowledge by repeated practice so that their interest is maintained over a longer period. A possible way to achieve this is to supply a wide range of scenarios and inbuilt animations, as children like to explore new concepts and they are inclined to be more enthusiastic and participatory if they have a positive experience (McFarlane et al, 2002). To optimise

this function, however, many choices are required and a balance between choice and complexity of interface is needed to maintain interest.

The process of this film production tool can be viewed in Figure 5.1 and the detail of each function will be explained in the following sections.

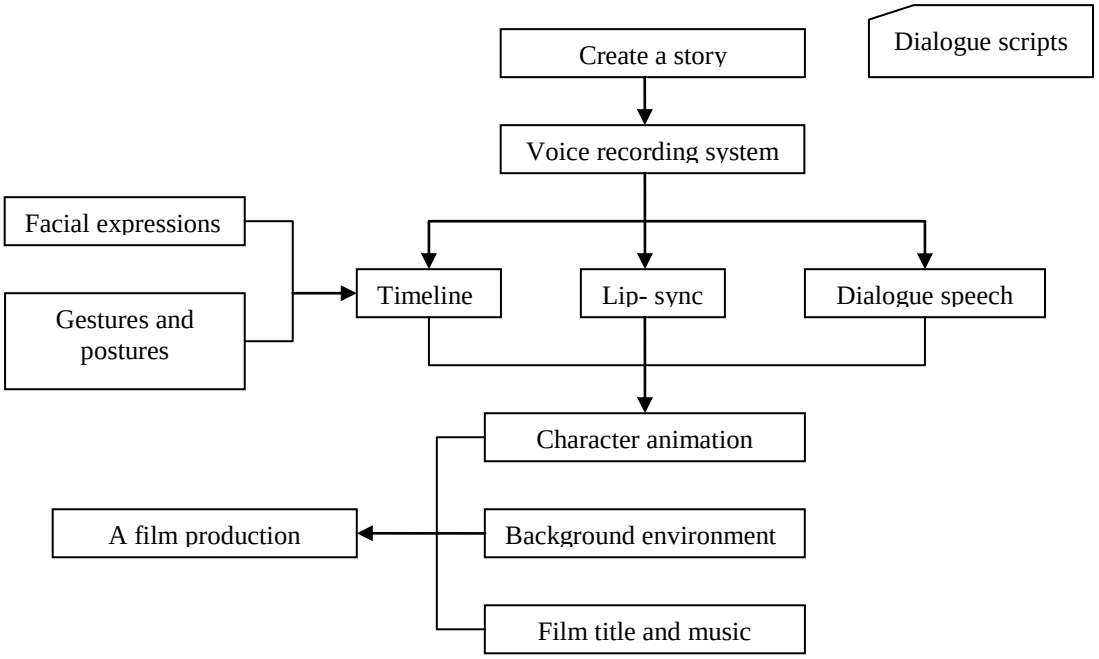


Figure 5.1: A flow diagram of this film production tool

5.4.2 Dialogue scripts

The scripts of dialogues should be prepared in order to make a dialogue-based film. The question is, 'Who will prepare these dialogue scripts, the children or the tool itself?' If the answer is the tool, then the development of the tool can be optimised according to prepared scripts. The benefits for doing this are: 1) the tool may be able to be designed to supply feedback in response to children's decisions on each piece of dialogue. For example, when children greet each other, if they select "happy" or

“smile”, the tool can tell them if this is the right expression, and also that “neutral” or “surprise” may be appropriate in some situations but other expressions, for example, “angry”, may be inappropriate on a specific occasion. 2) The tool is able to be designed to predict the gestures and postures to be used in the dialogue/story and supply a small number of choices from which the children can choose. This can avoid children becoming confused when they have to select a gesture from a large number of choices, as there is a vast number of gesture and postures used in daily life. 3) The tool can be designed to rely on these existing scripts so as to carefully prepare sample dialogue speeches, which should be appropriately emotional and in a clear voice, to give children an impression of how they should talk and to encourage them to follow these emotional voices.

Teachers prefer the tool to be able to adapt to their teaching plan. In the first pilot test the tool offered two options, where children could either use built-in scripts to make the films or use improvisational speech, to have a dialogue without any prepared scripts. Children’s responses to built-in scripts are predictable but they seem to prefer to speak freely, as they can use their own language to show a sense of humour or to make some interesting points. The teacher, however, preferred to create scripts through group discussion, which is valuable in developing children’s creativity and various group discussion skills and she can also decide the topics. Children functioning in a group discussion to create stories is an important part of her current teaching method and it is also suggested for use in the SEAL Guideline. The result is that the tool does not supply dialogue scripts for making the films, rather allowing the children to do this. It is indeed advantageous to encourage the children to create scripts as this can better satisfy the research objective, by way of assisting teachers in

their teaching. It does not, however, deny the value of predefined scripts, as the tool is specially designed to prepare scripts. This is possibly less creative but encourages more independent learning opportunities. Nonetheless, for children to use the tool at home it may be a good idea to offer prepared scripts.

5.4.3 Dialogue speech

A dialogue-based film is a verbal conversation between two or more characters. In the film, thus, the tool should find a way of turning the dialogue scripts into speech. There are two possibilities to achieve this, one being to use a computer generated voice, such as a text-to-speech generator. This would require children to input their scripts using keyboards, which could prove difficult for young children. Furthermore, most text-to-speech (TTS) engines only configure a small number of options, which can be problematic in adapting various dialogue situations and the TTS technique for emotional speech still presents a challenge. Another option is to develop a voice recording system with which to record children's voices. This is seen as being a valuable way for children to exercise their verbal skills. Children will be encouraged to make their recorded voice sound suitably emotional. They can keep trying to find the best way of expressing their feelings, such as alternatives of combining language skills and emotions in the tone of voice. The latter option is noticeably more valuable than the previous one, as regards the aspect of learning communication. The tool chosen to use as the voice recording system is important, however, as this will inevitably involve using a microphone. The tool will have to be able to introduce some appropriate background noises when voices are being recorded, especially in a noisy environment such as a classroom. The test used an independent microphone, which can reduce the environmental background noise and supply acceptable quality

recording in the classroom. There are also other noise-related issues, for example, there is always a ‘clicking’ sound when children start to record by clicking the mouse button.

The voice recording system includes functional components, interface design and sample voices. Functional components provide basic functions such as playing and recording. The tool uses a third-party sound engine, IrrKlang, so as to achieve these functions. An advantage of using IrrKlang is not only its supply of full functions for voice recording but also that it supplies low-level audio libraries, which are useful for advanced audio processes, such as lip-sync with audio. The interface of the voice recording system was designed using Macromedia Flash 8.0, so that the developer was able to create a customised user-friendly operating interface. This, for example, uses customised button shapes and their effects, using animation to increase the dynamic effects for the audio recording and playing. The tool being developed supplies many sample voices indicating a variety of emotions. These sample voices were originally selected from several professional sound-effect websites such as AudioMicro, Soundsnap and sound-effects (www.sound-effect.com). These sample voices are all quite clear and appropriately emotional and are intended to attract children’s attention and further encourage them to mimic the correct tone of voice.

5.4.4 Lip- sync

Lip synchronisation is designed to allow the 3D characters’ lip movements to match the voice in the film, which involves complex technology. The current research is not intended to explore this aspect but wishes to apply a developed lip-sync engine which can analyse the phonemes from an audio file and export timed phonemes or viseme, to

provide lip movement information. Some lip-sync engines (for example, Annosoft, Visage, et al) provide an SDK to allow developers to integrate them with their own applications but such engines are very expensive. SAPI Lipsync, which was developed by Annosoft, is the only free version available but it requires an additional package - Microsoft SAPI 5.1, to be installed in the computer. This is a possible option but it would inevitably limit the distribution of the tool and the setup in different computers might well be complex.

Other than using these highly specific lip-sync engines, there is an easy way to make a simple lip-sync process which is used only for mouth opening and closure. This simple lip-synch measures the amplitude of the wave-form from an audio file and the amplitude is used to control the degree of opening of the mouth. The tool has chosen to use this simple lip-sync method as it can be developed at no cost. The study test indicated children can accept this simple lip-sync but future development should consider using a higher quality lip-sync engine. The test also found various noises in recorded voices can affect the mouth opening and no simple solution was found except to reduce the ambient noise level.

5.4.5 Facial expressions

Facial expressions on characters are a critical part of a dialogue-based film. The tool should allow users to control the character's facial expressions in a dialogue. The use of facial expressions on a character has three major steps: recognising the expression, designing the expression and using the expression.

Recognizing an expression involves identifying how many expressions have been

used in the dialogue. The tool designed offers 24 different expressions, which are from the SEAL guidelines. Children will read the dialogue script or listen to the recorded voice, in order to pick out the required expressions.

Designing expression is used to create the required facial expressions on the characters. An expression design system has been developed to create expressions by controlling the eyebrow movement and mouth animation on the character. Following suggestions from the teacher and children, this step was extended to using a webcam, with some sample pictures. Sample pictures are a series of emotional facial photographs and are used to support children in acting out their facial expressions, as children may find difficulty in imagining an expression without a reference. Many of these sample pictures are from Clipart.com School Edition (schools.clipart.com). A webcam is used to capture children's facial expressions, when they follow the referenced pictures and act the expression in front of the webcam.

The expression design system for 3D characters was originally used in "Andy Rig", an animation system available in Maya, which was contributed by John Doublestein et al (Doublestein, 2007). It was easy to manipulate facial designs with good results, which introduced the idea that children might be able to use the same approach to design the expressions in the tool. Maya is, however, an animation and modelling programme and there is no simple way to import this system into the tool. In order to use this system, a redesign was required to achieve the same effects but in a different way. The interface was designed using Flash to produce a custom built interface similar to the original "Andy Rig" interface. The animation technique in the original system used blend shape interpolation to move the different aspects of facial features

and the tool uses the same strategy in the MOGRE (3D rendering engine for Net) programme.

Using expression involves inserting an expression into the dialogue and ensuring that it appears in the right place. This function is part of character animation and will be introduced in Section 5.4.8.

5.4.6 Gestures and postures

Gestures and postures are frequently used in a dialogue and should appear in a dialogue-based film. The design of gestures and postures is, however, a complex process for children to understand, as they occur in 3D space. In particular, some gestures, which contain animations such as shaking hands and clapping, require the use of a highly developed level of animation knowledge and skill. The complex gesture and posture development also means that the whole design process is time consuming, which is thus not suitable for use in the classroom. The tool does, however, offer many gestures and postures, from which the children can choose. Most of these were manually designed in the 3D animation software Maya and some involved using motion capture to create animations. Motion capture is the recording of real human actions and then using that information to animate 2D or 3D character models. The source of the motion capture data was Carnegie Mellon University Motion Capture Database (mocap.cs.cmu.edu). It would be preferable if all gestures and postures were created using Motion capture, as these actions seem more natural and realistic in comparison to those which have been manually designed. There are, however, only a few gestures and posture actions to be found in the available motion capture data resources. If future development demands better quality gestures and

postures an option would be to use a motion capture device and actors to produce the required data.

Gestures and postures are unique but some are widely used and well recognised. The tool aims to provide these commonly recognised gestures and postures. It is accepted that not all of them are suitable for use by children but it is also true that there is no clear way of distinguishing between what might be defined as children's gestures and postures, as opposed to those which would be accepted as exclusively pertaining to adults. The commonly used gestures and postures for adults have already been explored (Armstrong and Wagner, 2003) and some of them have been used in the tool. The choice of gestures appropriate to children, would appear to lie within the realms of perception, although it is accepted that there will be specific examples which would be inappropriate for use by children. Extended research could explore this issue in order to establish guidelines in determining the appropriateness of gestures and postures for children within different age groups.

5.4.7 Background environment

A dialogue requires a background environment to inform where the conversation is taking place. A standard way of doing this is to use various models to build an environment in a 3D engine just as most 3D games can freely move the camera to observe the models in the environment from different angles. A film does not, however, require the display of an entire background environment. If the camera is fixed, then a single real environment photograph is enough to indicate the location of the conversation. In the tool, the camera has two observation angles to provide a view of the two 3D characters' reactions during the conversation, thus, using a single

photograph cannot guarantee that the background environment will be correctly displayed. The tool chooses to use a skybox, together with various cubemaps, in order to build different 3D environments. A skybox is used to see the world as a cube and a cubemap comprises six connected photos (up is for the sky; down is for the ground; left, right, front and back are for the surrounding environment), which can be projected onto each face of the skybox to create a world environment. These photographs, which can be gathered from the real environment, are specially processed. Using a skybox and cubemaps is one of the easiest ways to resolve the environment display problems which are caused by changing the camera angle. The cubemaps employed in the tool comes from a Cubemaps website (www.humus.name).

5.4.8 Character animation

Once the dialogue speech, expressions and actions have been prepared, the next step is to combine them to produce a character animation. A common way to develop 3D animation in Maya is to use timeline chart and keyframe animation. A timeline chart is an editing view and allows the animators to arrange audio track and character animation in detail. Keyframe is a technical term for pose to pose animation, as well as when one pose changes to another and the smooth transition in between two poses will be achieved by linear or spline interpolation. In the tool, the interface of the timeline chart and its functions are developed using Flash. It was intended that this would provide an intuitive operational interface and together with a step-by-step tutorial would help children understand what a timeline is and how to use it to make the character animation.

Moving from a static expression to a dynamic facial expression can use three temporal

parameters: Onset, Apex and Offset (Essa, 1994).

1) Onset duration: How long the facial expression takes to appear.
2) Apex duration: How long the expression remains in the apex position.
3) Offset duration: How long the expression takes to disappear.

The tool uses this method to achieve a simple dynamic facial expression. If, however, the future development aspires to achieve a more realistic result, the following suggestion might be considered. In the tool, the intensity of a dynamitic facial expression always has the same value during the Apex stage. With real humans, however, this value is changeable. The complexity of human reaction leads this change to being unpredictable and with individual differences but it is not necessary to completely simulate real human behaviour. Even if a basic change is possible to allow facial expressions to appear more dynamic, the change can be controlled by a mathematical formula, which operates from observation of recorded video with facial animation.

For gestures or postures there are poses such as the thumbs up, which are processed in the same way as dynamitic facial expressions. For gestures or postures with repeated animation, for example waving, these are designed to adapt the infinite loop. If a gesture at the Apex stage is longer than its animation length, the gesture animation will be extended by adding new cycles, until the length of the animation exactly matches the Apex duration. The tool does not contain gestures or postures with non-repeated animation. If, however, these gestures are involved, the gestures animation would play them only once and wait for the rest of the Apex duration. For some gestures, like silence, where there is the need to coordinate with facial expressions there is no ideal solution, unless children are aware of the need to synchronise this

manually. For some gestures there is the requirement for two character interactions, an example being a hug; these gestures were excluded from the tool as inclusion would be likely to increase the complexity of the interface operation and thus possibly decrease the usability of the tool.

5.4.9 Sample expressions

With regard to using sample expressions, the system offered seven categories including six basic moods (this was in accordance with Ekman's (1973) suggestion, these cross cultural expressions are "Happy", "Sad", "Fear", "Anger", "Disgust" and "Surprise"), and additional category "Other" was introduced for any other excluded emotions. Under these moods, similar emotions were included in the same category such as the category of "Happy" which contained a range of emotions like 'Smile', 'Big Smile', 'Laugh', 'Excited' and 'Proud'. Furthermore, it is often that a facial expression of emotion can be exhibited through a different way and it is better to address this diversification so that children could make choices according to their preference. However, it is also not suggested that an exhaustive list of every possibility be used as the number of emotions in each category should be limited otherwise it could take too long for them to make a choice as some children prefer to review all these emotional faces before they make a decision.

Currently, the use of sample faces provided two choices: the photograph of a real human face or a cartoon face. Are there any specific reasons to support one more than the other? Cox (2005) believed that real faces contain too much redundant information while the cartoon face is easy to understand. In contrast, Heinz (2007) stated that real faces can be better understood as the real face has rich information,

and her study confirmed that children met more problems in categorizing emotions in cartoon faces than in real faces. It seems that the photograph from a real face can cause arguments as it may depend on emotions displayed on these photographs. In this study, both photographs from real human faces and cartoon faces were used, but the use of real faces needed to be done with caution as it is important to make sure that the position of the facial features could be clearly observed and distinguished from a neutral expression. Moreover, if some kinds of real human facial expressions were difficult to clearly identify then using cartoon faces would be the first choice.

However, the current limitation is that no adequate photographs from real human face and cartoon faces were available to support several of the emotions. The main difficulty is that it would involve a risk if using most online photographs as these were not licensed. It is suggested that a further development can be considered of buying some licensed facial expressions under this guidance.

5.5 Implementation

The tool has been developed using Microsoft Visual C# as an overall framework and the graphic engine OGRE is used to render the 3D environment and character animation. The major user interface was developed by using Windows Form controls, which are components of Microsoft Visual C# but some user interface components had special requirements as to their functions and hence these were custom-developed under Macromedia Flash8.0. These included the control system of facial animation and timeline. The usability of the interface was specially designed for children so that they can easily manipulate the control system, for example, as regards recording sounds, designing facial animations and applying animations to 3D characters. The

external devices needed include a microphone and webcam, which were used to record speech and capture users' faces.

The tool includes four major steps to make the film. These steps are initial stage, voice recording, expressions designing, and making the animation.

5.5.1 Initial stage

The tool offers four 3D characters, two girls and two boys. Initially, a pair of users will input their names and select the character who will represent them (See Figure 5.2) in the conversation. If users are beginners, they can enable the voice tutorial by selecting, 'I want to have a voice for introduction' and then they would receive more instructions to help them use the tool at each stage.

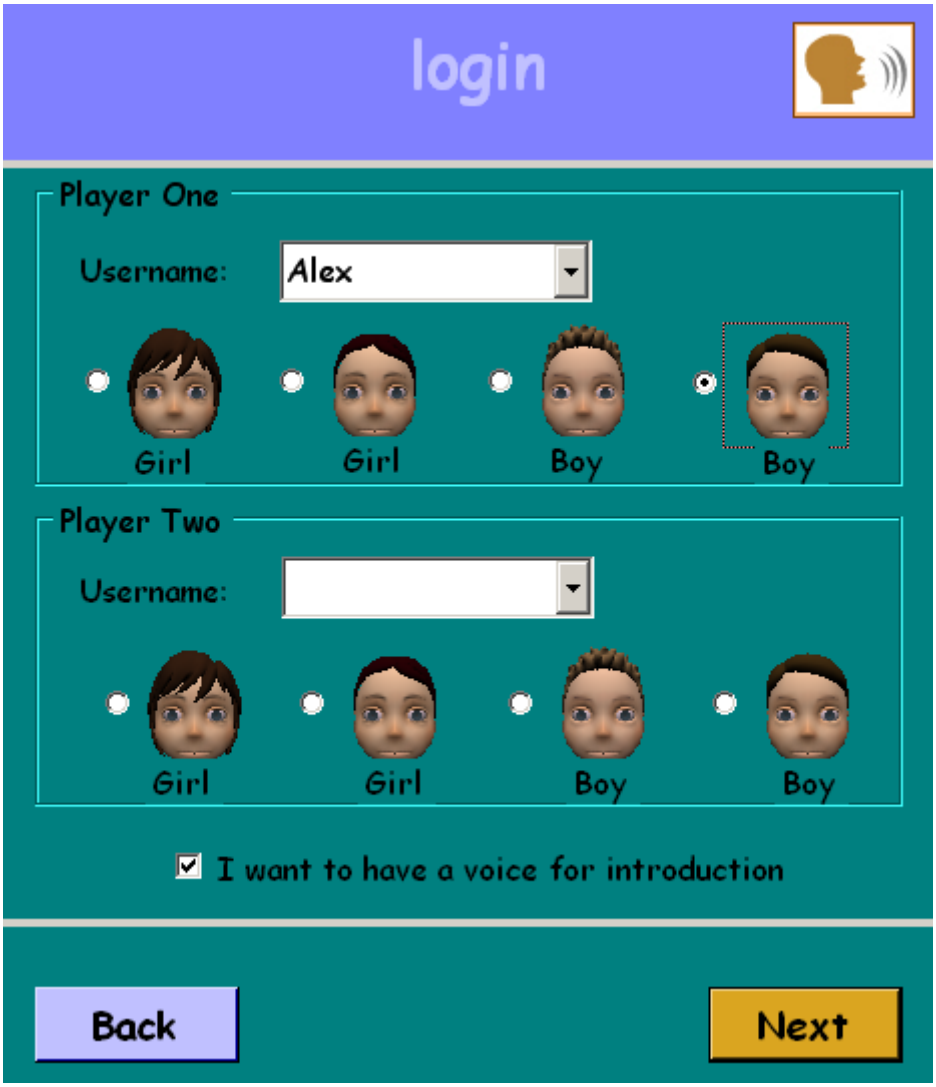


Figure 5.2: Login operation interface

The next step is to pick a story. A story is not only essential to form the basis of the film but it decides what children are going to discuss. In Figure 5.3, it can be seen that five stories were available for the initial school testing. These stories explore the topic 'Changes', which is one of major issues in the SEAL subject. In UK primary schools it is for the school and teachers to decide the teaching method and topics or issues to be explored in the SEAL class (DFEE & QCA, 1999). The result of this is that stories can be adapted based on the teachers' individual requirements and the school guidelines.

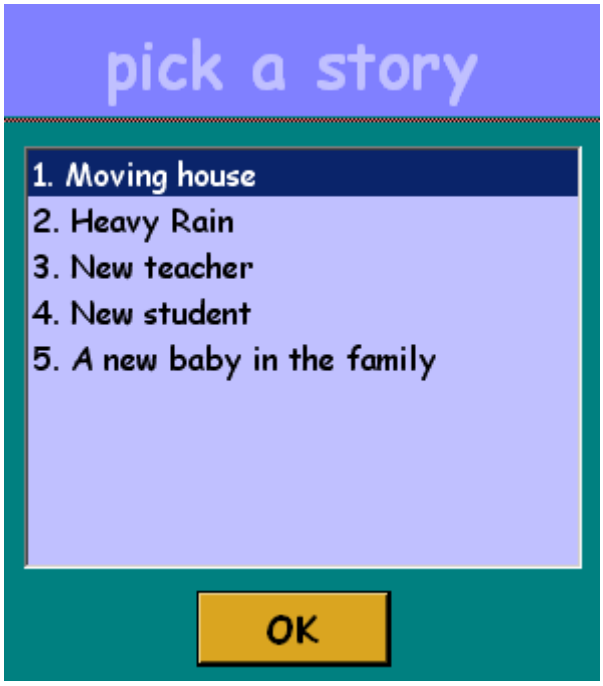


Figure 5.3: Pick a story

After the story has been chosen, a sequence of images and texts, along with a voice monologue is presented to describe what is happening in the story. Finally specific instructions for the particular story will be given regarding how to make a dialogue. An example, which can be seen in Figure 5.4, shows a few basic instructions for making an emotional dialogue. Teachers may not, however, be satisfied with these basic instructions and some may prefer to have more requirements based on their lesson plans. For example, in the experimental study, teachers opted for investigating how many types of expression could be used in the stories, before the children acted out their stories and then they asked the children to try to use these various expressions when they were making a conversation. As a result another option for this step is to follow the teachers' instructions, either because teachers may have different instructions or have more detailed requirements.

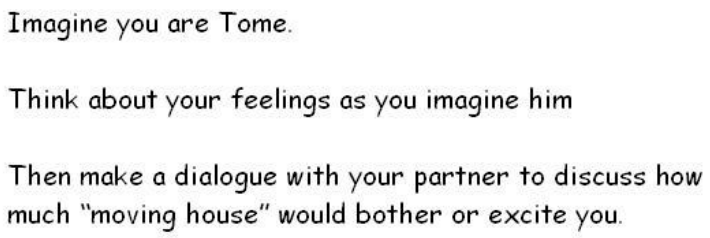


Figure 5.4: An example of listed instructions to make an emotional dialogue

5.5.2 Voice recording

The tool has an in-built voice recording system (See Figure 5.5). The system requires users to manually record every piece of dialogue, based on the given speaker's name. Users can determine the dialogue content through group discussion and write it down on paper. Then, two users take turns in recording their prepared dialogue for use in the film. In this way users would have time to produce an appropriate dialogue and can also spend time thinking about emotional words and the appropriate tone of voice. Alternatively, improvisational speakers can speak as, how and when they wish. In order to encourage the use of emotional speech, some samples are given using different tones of voice, for example, happy, angry and sad. The users listen to these samples and compare them with their own speech, which may motivate them to alter or improve their speech.

Figure 5.5: A voice recording system

5.5.3 Expression design

It is essential to be clear and definite as to how many expressions have been used in a dialogue. Users can replay their recorded voice and choose appropriate expressions for each piece of the dialogue. The tool offers 24 inbuilt expressions, which are from the SEAL guidelines but more can be manually added by users if desired. (See Figure 5.6).

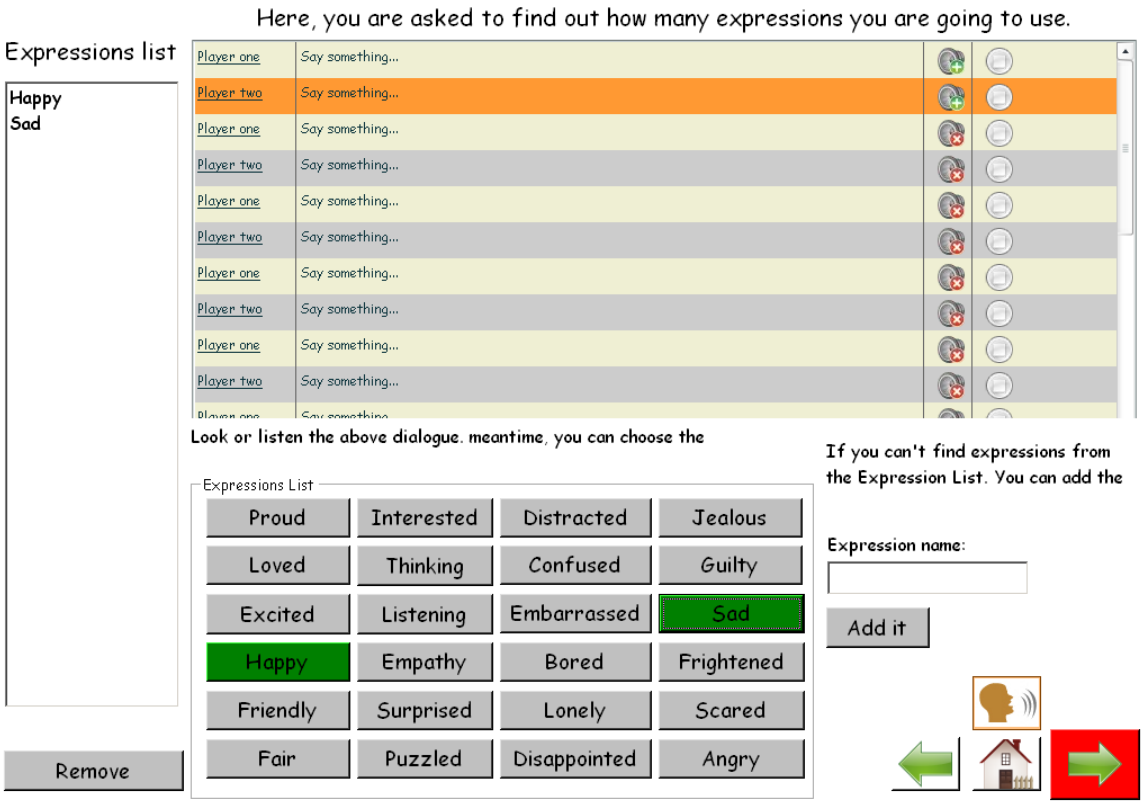


Figure 5.6: Choosing the desired expressions

All these desired expressions will be designed one at a time. The following is an example of how to produce a ‘Happy’ expression, to explain the whole design process.

Initially, (See Figure 5.7), users are asked, “Which one is your favourite expression for Happy?” They can repeatedly click the ‘Happy’ button to review all the pictures in the ’Happy’ category and then make a decision to select one sample expression.

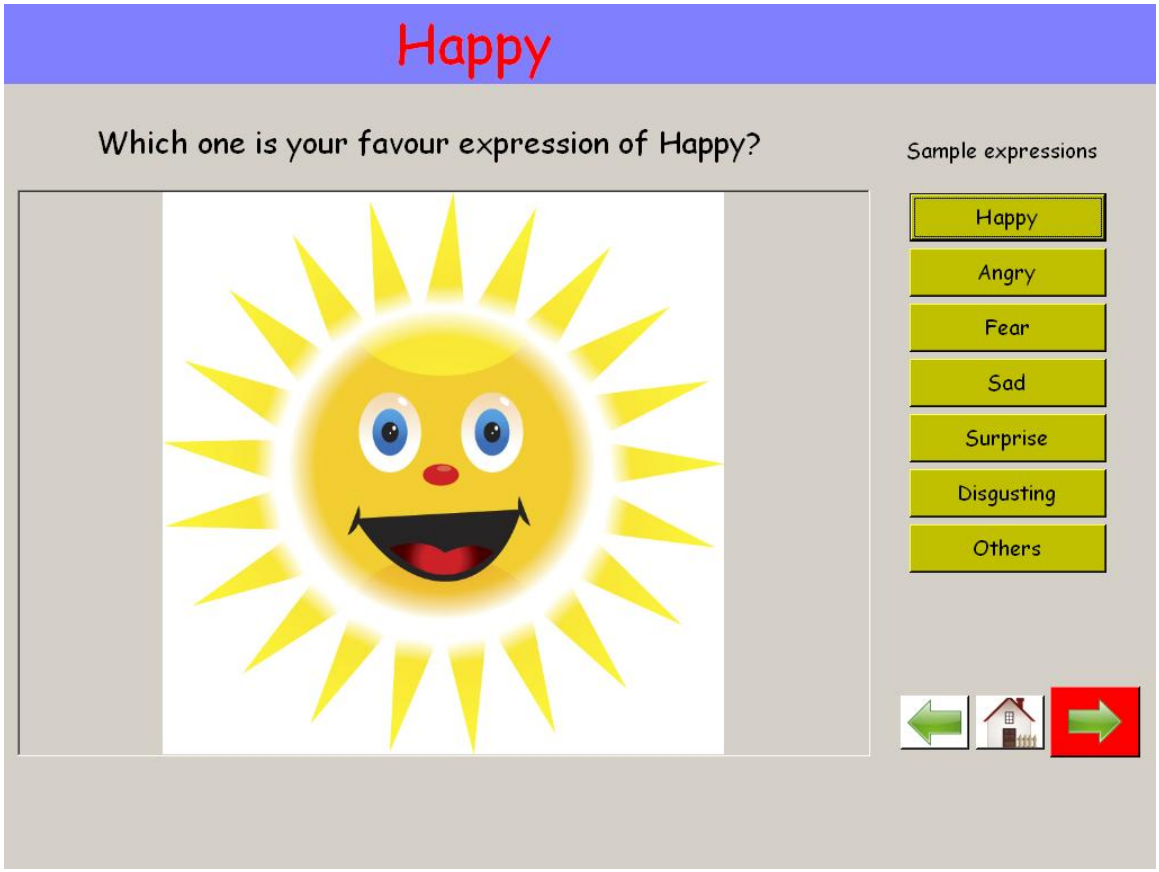


Figure 5.7: An example of sample expression ‘Happy’

Then, users move to the Face Capture Screen, as described in Figure 5.8, where there are two images on the screen. The right hand image is the selected sample expression which is aimed to guide users as to what a ‘Happy’ expression looks like. The left hand image is the real-time captured image from the webcam. When users start to act out a ‘happy face’ in the front of the webcam they should adjust their expression to make sure they are displaying a ‘happy face’ which closely resembles the sampled ‘Happy’ expression and then click the button to capture the image. Users are allowed to redo their work until they successfully capture their ‘Happy’ face.

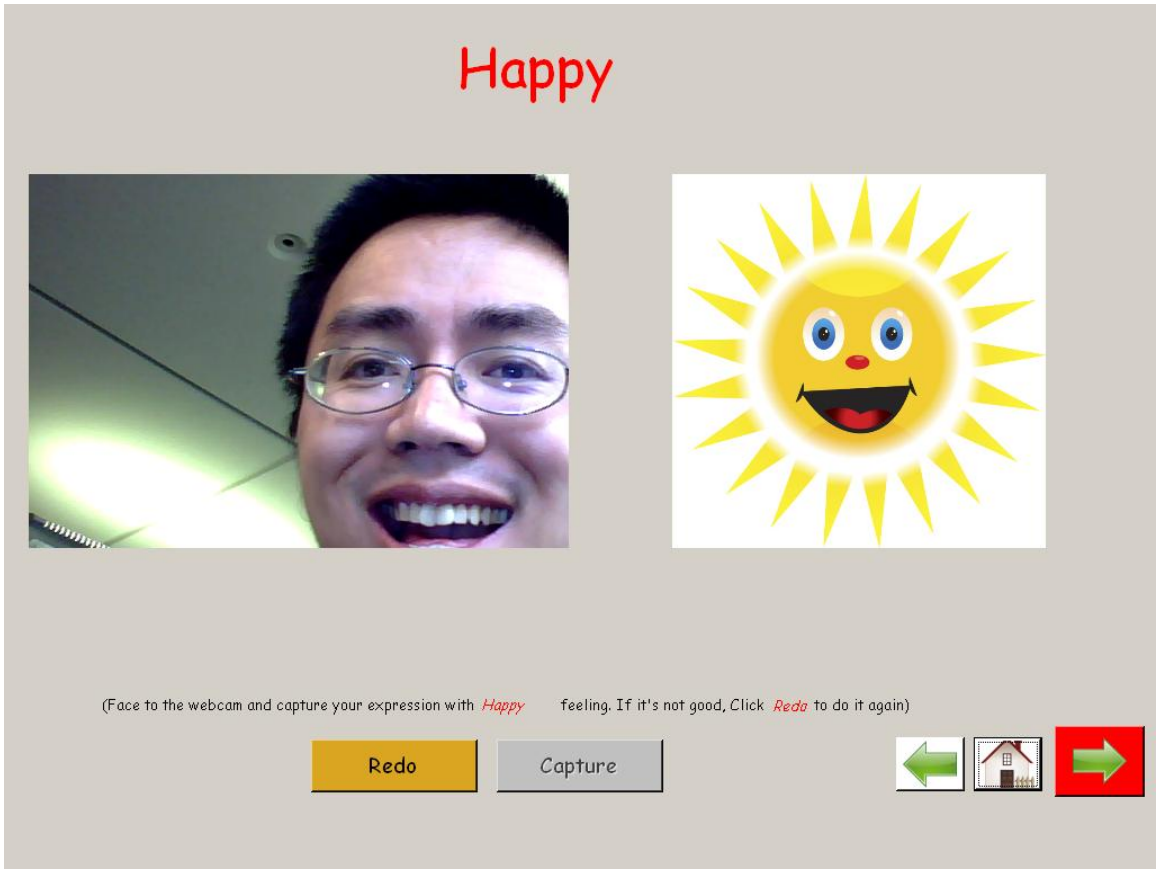


Figure 5.8: A captured expression ‘Happy’

Finally, the captured face is used to guide the user in designing a realistic happy expression on a 3D character. Figure 5.9 shows the expressions design system, which supplies eight components to control each part of the face. The captured face is then viewed next to the resulting expression. The last step for the users is to control these components by using the mouse or keyboard, to make the 3D character look happy. When they finish, they can then go back and repeat the same process, to complete the rest of the expressions from the dialogue.

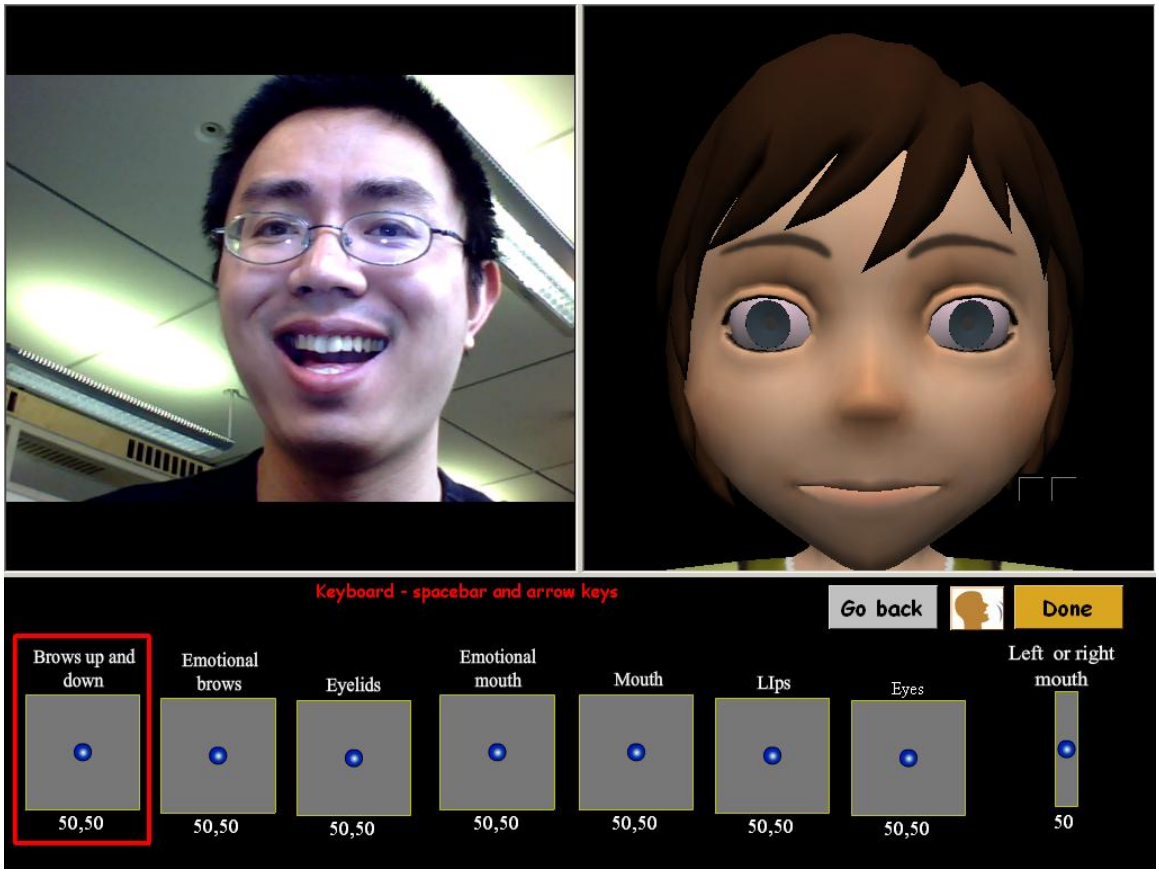


Figure 5.9: An expression designing system

5.5.4 Making an animation

Firstly, the film requires a background location for the story. The software tool supplies a list of alternatives, the options being pictures taken from a real environment (See Figure 5.10).

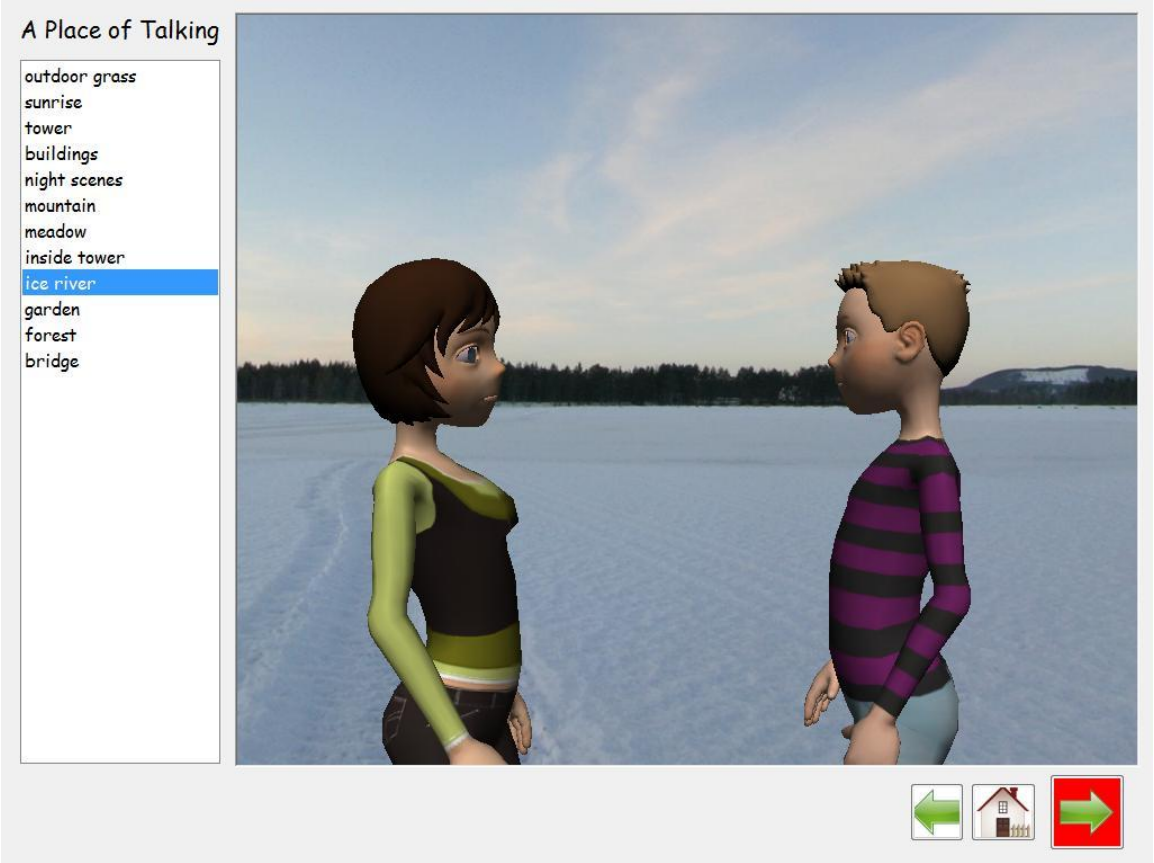


Figure 5.10: Background locations for the story

Secondly, users start to design character animation in the film. The character animation in a dialogue contains three parts: speech (voice), character expressions and actions. Designing the action is not a function provided by the tool, as this is a demanding process. The tool rather offers many common speech-related gestures and postures, with instructions as to how to use them (See Figure 5.11). A major challenge is to bring together speech, character expressions and actions, in order to produce a complete character animation in the dialogue. Here, the concept of a film timeline has been introduced. Each user, at each turn of speaking, generates a timeline. The length of the timeline depends on the time involved in the recorded speech. Users choose an expression from a list which contains all the expressions they have previously designed and add it to the timeline. The beginning and ending time of the expression

can be changed, to ensure it is suitably located, as well as being synchronised with the recorded speech. The body language is treated in a similar fashion. At any time, users can click ‘play’, to see if the character animation is synchronised to the speech. An example of a developed character animation can be seen in Figure 5.12. The timeline is a new concept to the users, thus, the tool provides a step-by-step tutorial to show how to set character animations on the timeline.

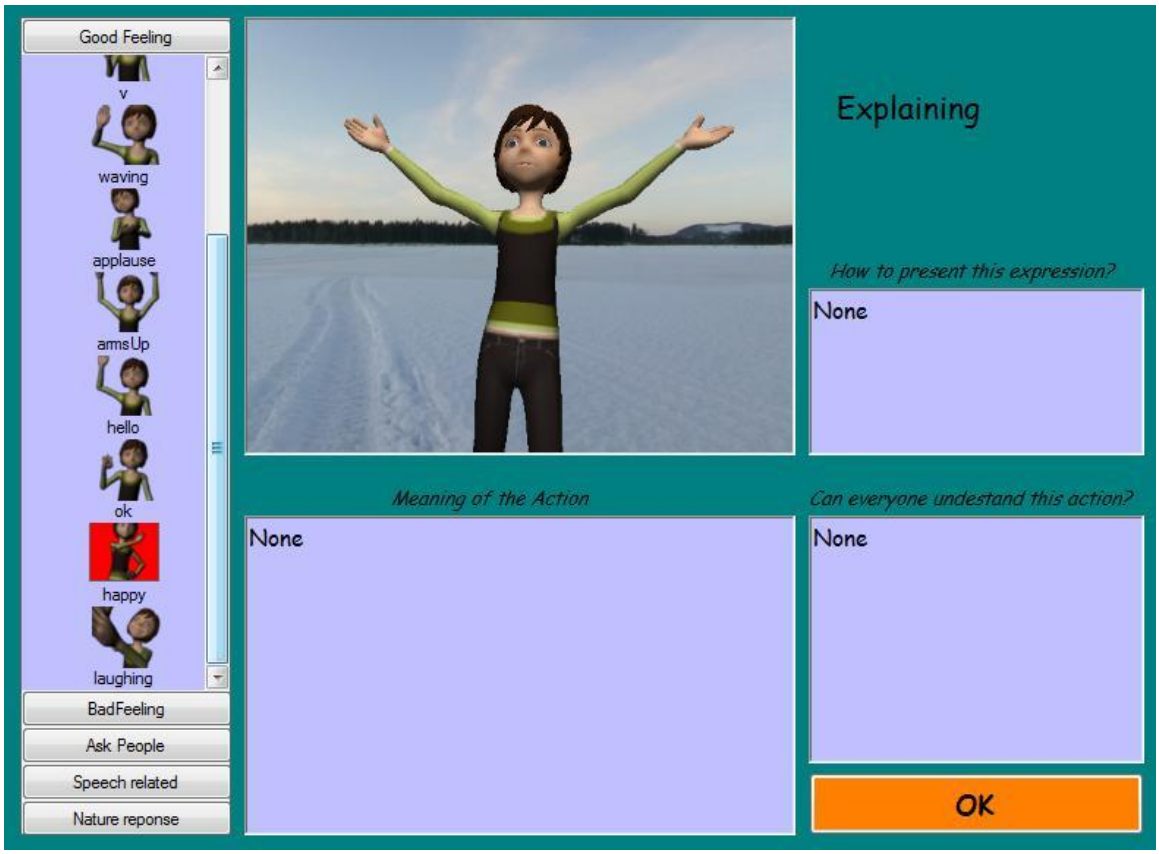


Figure 5.11: Some common actions in the conversation

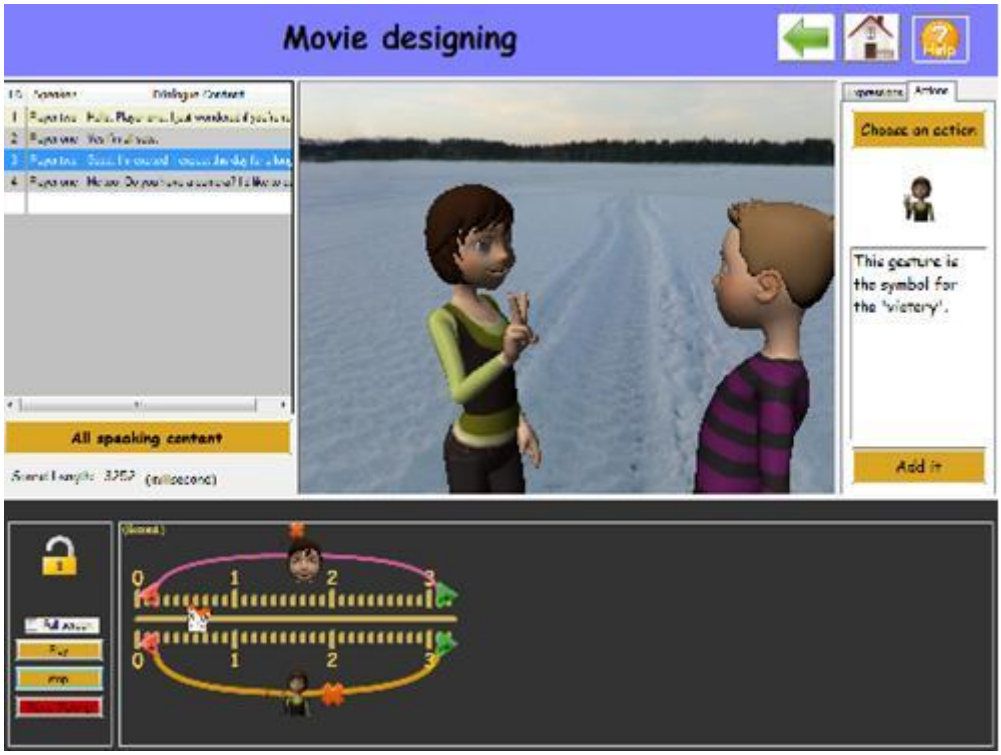


Figure 5.12: An example of designing character animation

Finally, users convert the designed 3D character animation into a film format and can give the film a title and other credits. They can save the film anywhere on the computer and can share it with peers, parents or others.

5.6 Summary

In this chapter, the development of the tool has been introduced from the theory to its detailed design process. During this process, many theoretical issues, such as cartoons and effective learning have been explored for educational value and these functional modules in the tool design have been analysed, in order to find the best solution to support these theories. The implementation of the tool is designed to describe the flow path when children experience the film production process, in order to create character animation. Using the tool to make the film, compared to actual film

production, has been greatly simplified, omitting many details perceived to be inessential for the study's purpose. These inevitably limit the film's creativity and reduce the quality but the simplified procedures make it possible for children to create a cartoon film.

In general, making a film is a large and detailed project. The completed tool design is, however, viewed as a framework and there are still significant areas to further explore regarding each part of the film design and also as regards to its value in terms of learning communication skills. The developers' individual areas of expertise and their thoughts can place emphasis on different parts of the communication skills learning process. For example, if a developer is particularly skilled in sound analysis and feels that the tone of voice is critical, more detailed consideration can be devoted on how to enable children to improve their use of emotional speech. Naturally the interface design, technology, and design ideas have to take cognisance of the limitations imposed by the developer's funding and individual abilities, including programming experience, knowledge of the film production process and experience in relation to children learning behaviour skills.

CHAPTER 6

Tool testing

6.1 Introduction

The software tool development was introduced in Chapter five and this chapter explains how the tool was used and how experiments were conducted, in order to test the hypotheses described in Chapter one. The experiments comprised three steps; the first of which was testing the utility of the tool and collecting data to inform improvements in the design. The second step introduced a tool-based approach for learning communication in some SEAL courses and the effectiveness of this approach was measured by comparing with a conventional teaching approach. The final step tested the tool in use in an out of school environment, so that children could be guided by their family members.

6.2 Initial testing

6.2.1 Acceptance testing

Purpose

Since the software tool had already been developed, the next step was to evaluate its usage in the classroom. Before the tool could be subjected to acceptance testing, however, it was necessary to establish any problems in the usability and interface design from the children's perspective, as well as regarding their learning and engagement behaviour and preliminarily testing was thus required. Many ideas in the tool design were based on the researcher's viewpoints and some might thus not

be effective or may be disliked by children. Hence, it was critical to have their feedback, to adjust the tool or make appropriate changes, if necessary. Moreover, this testing was also to allow teachers to evaluate the popularity of the tool in the classroom and their observation of children's usage could help them to consider suitable arrangements for further classroom integrated testing.

Methodology

The questions and the observations comprised two major methods, to assess children's views of the software.

Children should be able to answer simple questions at the end of this testing but their comments, especially for constructive improvements of the tool, might prove difficult for them to express. To address this problem, the testing would be presented before the whole class, permitting other students to give their suggestions, even if they were merely observing the process, and a group discussion was more likely to extend the discussed issues, which could make feedback more comprehensive and consistent. Moreover, each question should not only focus on their overall experience of software usage but specify each part. For example, children would be asked questions when they looked at the interface of the voice recording system, as this visualisation could stimulate them to think in depth and provide detail.

With regard to the observation process, players were monitored on their learning and engagement behaviour and other students were also measured on their interests regarding this software tool. The process of observation should receive feedback as regards software interface design for the purpose of the usability improvement after

the experiment. Some pre-concerns were:

- **The operability of each screen**: The interface of each screen should be easy to use.
- **The clarity of recorded voice**: A suitable film should have clear voice recording but the clarity of voice might depend on the noise level in the classroom.
- **The ability in mouse control**: Basic mouse control was required with this tool.
- **The usage of gestures**: The tool had a large number of gestures, which correspond to different situations in different dialogue but this could also lead to a usability issue.

Other unanticipated issues could also be identified as regards the practical observation. In fact the best option was to use a video camera to capture the testing process, so that there would be plenty of time for result analysis but this was not allowed in primary schools. To compensate for this problem, four independent researchers attended this testing and gave comments from their points of view.

Process

The acceptance testing was conducted in a local primary school. At the beginning, the usage of the software tool was demonstrated in front of the Class 3 students, who were 8 to 9 years old and carried on their activities in a classroom, with a projector running, so that others could observe from the projection screen while the tool was being used. Initially, the tool was demonstrated to show how to use it as well as each feature being introduced. This initial demonstration was to give students a general impression but this was not intended as a full explanation. Hence, this process was

simple and quick. Then students were asked whether they would volunteer to play with the tool and almost everyone put their hands up. The first pair was randomly selected and two other pairs were assigned by the teacher due to their good language skills and computer operating ability. The sequence of these pairs was played one by one.

The tool started by the players choosing a character and inputting their name. Both players, a boy and a girl, could type their name using the keyboard. After that, they moved to, 'pick a story screen'. There were two options to choose from, a pre-made story or to create their own story. The boy asked the girl's opinions and then they decided to make their own story. In the next, 'voice recording screen', the boy controlled the mouse to move around the screen, neither of them noticing the location of the start point. Since they needed support, detailed instructions were provided but soon they faced a new problem. In their recorded voice they had a long segment of silence, due to them needing time to thinking before they were ready to talk. It took them some time to learn the necessary cooperation whereby one player helped by clicking the 'start recording' button, just before the other player started talking.

After the dialogue had been recorded, they moved to the 'expression design screen'. At first, the boy did not know how to manipulate this interface and asked for help. The interface was controlled by many small radio buttons and these buttons could be depressed and dragged. After the required manipulation had been explained the boy took much time to learn how to target the mouse cursor, use the small buttons and use dragging feature. He frequently missed the buttons and struggled to move the mouse while dragging. However, the girl learned more quickly. They sometimes guided each

other on how the facial emotions should be designed, such as in relation to eyebrow movement, as well as receiving tips and operational suggestions such as, “You can try this button…”. This discussion was, however, quite simple, in that one gave the other a suggestion and the other simply accepted or ignored it. Debate almost hardly existed.

The last step was directed to the ‘make animation’ screen and this screen was used to choose suitable expressions and gestures and apply them to the character animation. Again, the boy and girl seemed uncertain where to start until instructions had been given but they only needed initial guidance before quickly being able to repeat the interface operation with minimal instructions. Initially, the boy and girl spent much time on reviewing these pre-made gestures one by one, on using them for the first time and sometimes stopped and watched if they found the gestures of specific interest to them. Each time repeated reviewing was required in order to make a good decision and their decisions could often be affected by the teacher, researchers or other students. The boy was once uncertain as to whether the gesture ‘shrug’ was suitable, as he dwelt on this gesture for a while but he then made a decision when other students were indicating support for this gesture.

After the testing of the first pair, the other two pairs required less instruction as to how to manipulate each screen. In addition, a boy who had much previous experience on using computers preferred using the touchpad, to take the place of the mouse control. He set a good example as to how the touchpad could be used to accurately control the position and his partner and the third pair followed his idea but the touchpad was less easy for others to use and they spent much time in locating and dragging, which

slowed down the interface operational efficiency.

Result analysis

Regarding using emotional skills, a girl who had language talent produced a very attractive voice in her dialogue with her partner. Her mimicked voice displayed many amusing emotions, which made everyone in the classroom laugh. Not everyone was, however, able to display such good emotional skills. A boy who was a little shy was less capable of showing emotion but he did try hard under the circumstances. The expression design system was another aspect which led to humour, when players were asked to copy a facial expression from a given photograph onto a 3D character. Many players tried to precisely follow the reference photo but some added a few more features and created facial expressions of too great emotion. This was especially true of a boy who designed emotional expressions which were entirely different from the facial expressions in the original photograph but his design amused the other students who kept laughing and as a result he apparently felt good.

Players in all three pairs could concentrate all the time and enjoyed their involvement. For the class students, there was no evidence of negative behaviour, such as yawning and all of them seemed focussed on the screen all of the time. There was laughter throughout, indicating pleasure and some students offered suggestions and comments although they had been told to remain silent. More students indicated a wish to play, however, the time available was limited.

At the end of the testing, the classroom students were asked to give their comments. Everyone said that they liked the ‘game’ (This software is actually a tool rather than a

game) and would like to play with it by themselves if they could. Students were then asked many basic questions, ranging from the functional design to interface design, on each screen. Their response was far better than expected, as each question received many different answers and some were able to offer innovative ideas. For example, one student said it would be much better if there could be a way to record their own facial expressions. The issues identified will be discussed in the following section and possible responses and solutions will also be explored.

6.2.2 Identified issues and improvement

The acceptance testing identified four problems as requiring attention which might increase the value of the tool. These issues were summarised as:

Problem one: Lack of instruction

Results from both observation and questions had clearly demonstrated that students could not understand how to operate the software interface with the current levels of inbuilt instructions. In the voice-recording screen, for example, they were confused as there were too many buttons on the screen and they did not know where to start. In the expression design screen, the pattern of mouse control changed from, 'click' to 'press down and drag' and students were unable to discover how this should be operated without being told. In making the animation, the interface operation was apparently not difficult to master as they could quickly adapt after a demonstration but this screen introduced a new method of operation which was specially designed for filmmaking and anyone new to this operation was unable to comprehend its usage.

Solution: An audio tutorial function, which was recorded using NaturalSoft text-to-speech, was added at the beginning of each screen. This computer-generated voice

might not be as emotionally realistic as human actors but it was perfectly clear and easy to change where necessary. Besides the voice instruction, each screen had a simple text description, immediately below the functions, to allow for those who might prefer to read text. The animation screen, however, required description of the steps of the interface operations, rather than an introduction to the interface functions. The result was that a special tutorial was designed for students to use during the initial session. This tutorial included a step-by-step guide using a combination of images, text and voice.

Problem two: Background music distracting

Some students thought that the background music was repetitive and it distracted them from playing. They would like to have a way of disabling the music or not having music while the tool was being using.

Solution: The original idea was to use music to create a pleasant environment, which was expected to increase the enjoyment but the result seemed to have had the opposite effect. Consequently the background music was removed rather than introducing a muting option.

Problem three: Mouse control

From the observation students seemed to have some difficulty in using the ‘press down and drag’ function and some tried using the touchpad instead of the mouse control but the touchpad was not easy for them to use, if they had not used it before.

Solution: some students did have some difficulties in using the advanced mouse control but this issue was not serious, as they could learn to use it and more importantly, none of them referred to this difficulty when they were asked to give

their comments. It would, nonetheless, be better to address this problem, hence, a keyboard control was added and players can either use the keyboard or mouse controls.

Problem four: Decision-making for expression design

After the testing other observers indicated their opinions on any matters of concern. It had been observed that students did not always choose appropriate expressions for the dialogue because the design of each expression required children to recall dialogue content and this could sometimes cause confusion and uncertainty. It was suggested that the tool should have had a decision-making system which could decide how many expressions would be used in the dialogue, before students moved to the expression design screen.

Solution: A new screen of expression decision-making was added, with 24 commonly used expressions that players could listen to or else they could look at the dialogue content to decide what expressions they wanted to use.

Suggestion one: Real name for the dialogue

Two pairs of students were chosen to act out prepared stories and each piece of dialogue in these stories was original, using a character name, such as "John: 'Hi, Sammy, How are you?'" Some students did not like these fixed names and preferred to use their own names instead.

Solution: This suggestion was accepted. In the new implementation the story is rebuilt using the username the student entered to replace the characters' names.

Suggestion two: Face capture

When the teacher and students discussed the expression design screen they suggested that it would be a good idea if players could capture their own facial expression through a webcam and then they could use this captured face to design a similar expression on a 3D character. Many students had shown an interest in this possible function, as they thought it would be fun.

Solution: This suggestion was accepted. Originally, in order to help expression design, players would choose a sample expression from the facial expression store before they moved to the expression design screen. The change replaced this function, by using a real-time captured face from a webcam.

Suggestion three: Gestures design

There was also a student who suggested that the change of gesture and posture could be the same as that of designing expressions as it would be more fun if they could design their own actions.

Solution: This suggestion was not accepted. This function might further enhance students' creativity and enjoyment but there were potential technical and usage difficulties. Currently no existing 3D gestures/postures design system was suitable for children to use. The industrial method would be the only option but the obvious difficulty was that the action design would be complex and time-consuming work, especially on a 3D character. A new research study would be needed in this area to establish an easy way in which children could achieve this and this matter will be further discussed in Chapter Eight - the future development.

Suggestion four: Background environment

The teacher thought that a film should have an environment so that players could decide where the conversations take place. Some possible environments might include indoors, outdoors and grasslands.

Solution: This suggestion was accepted. The applied environments were captured from some realistic scenarios. The variety of scenarios included different seasons, weather, time (day/night) and places.

6.2.3 Test solution and result analysis

After these solutions have been implemented, another test was arranged to evaluate these major changes. Three pairs of students took part in the test and three laptops with attached devices, such as a microphone and webcam were prepared, so they could play at the same time. Two of the students had participated in the previous test and the others played with the tool for the first time. At first, there was an introduction to the tool where the use of tool was explained. Then, the teacher randomly assigned six students into three pairs and each pair was given 45 minutes to produce a film.

Resulting from the added tutorial (also known as voice instruction), observation found that the longer tutorial should have the option to be disabled. A boy, who had joined the previous test tried to avoid the longer tutorial on the filmmaking screen and one pair of students did not have the patience to listen to the second longer tutorial when they started to produce the second and third films. In the overall experience students and teachers thought that the tutorial was fine, although the observed result illustrated that some of them still needed a few tips for some screens after the tutorials.

In the expression design screen, a keyboard operation was added, as an alternative to

the mouse control. Few, however, were interested in using the keyboard. Despite being given a demonstration of keyboard operation one student soon changed back to mouse control. Obviously students were more likely to use the mouse control, rather than the keyboard, given the choice.

One of the important changes was that a decision-making screen was added, to decide how many expressions were going to be available regarding the dialogue. During the playing of this screen, many students started to discuss which expressions would be suitable to use and some students replayed the recorded voice, in order to make an appropriate choice. Most of them made decisions based on their feelings, rather than on the expression. For example, one student had chosen the ‘happy’ expression for one sentence and the ‘excited’ expression for the next sentence. There was little difference between the two expressions when they appeared on the face but the choice reflects a slightly different mood. Of course this frequently led to students being confused when asked to act out an expression in front of a webcam and this was what they needed to learn as regards the difference between emotional words and real expressions.

Face capture became the most exciting feature in this testing. Students enjoyed acting their facial expressions in front of a webcam, no matter whether their acted expressions were emotional or not. They performed particularly well in some basic expressions, for example, ‘happy’, ‘sad’ or’ angry’ but they were less capable in acting other developed expressions, such as ‘friendly’, ‘guilty’ and ‘lonely’. The teacher suggested that students need guidance on how to make a particular expression and a possible way was to give players a sample picture with an expression, so that they

could use the picture to guide their own expression. (A later solution: these sample pictures reuse previous facial expression storage, which were deleted after the improvement of the first acceptance testing.)

Other solutions were also accepted but did not raise particular concern. When students were asked to give their comments they all thought that the playing process was very enjoyable and opined that no further improvement was needed. The teacher thought the tool to be a creative way of educating pupils and that it could be further integrated with other subjects in the primary school. The tool, at this stage, passed the acceptance testing, although slight adjustments were still required. The next step was to test the tool being used in classroom teaching.

6.3 Classroom testing

6.3.1 Test one

Purpose

Both initial testing and classroom testing had the assessment objective of learning behaviour but the initial testing was for the general usage, whereas the classroom testing was targeted on the practical teaching value. In test one, effectiveness of learning communication would be assessed when the software tool was used to support the teaching activity in a SEAL theme.

Methodology

To properly evaluate this tool would take long-term use in the classroom, however, the tool was not intended to be the only one used to teach communication skills.

Timetable pressure and the nature of the classroom, made it difficult to use some innovative techniques on a regular basis. Furthermore, students' behaviour during learning communication could be affected by external factors such as conversation with family members, friends and class mates. As a result, a better way to evaluate this tool was to compare it with the teaching methods already in use, as a control.

In order to measure the effectiveness of the tool it was not felt to be appropriate to use a paper based activity with the control group as the effect of the novelty of the approach would almost certainly mask any effect the tool itself was having. The result was that in the control group it was decided to do a more unusual task that had, however, previously been used by the teacher. In the control group then, students acted out their stories in front of a digital video camera. In both groups the stories chosen were covering the issue of facing changes, which was a typical theme in SEAL. In this lesson, stories, the teaching element focused on adapting to using emotions.

In order to minimise the effects on their behaviour the control groups were led by the teacher, so students would be familiar with her methods. The test group were also attended by a classroom teaching-assistant with whom students were equally familiar because students working with a familiar person will show dynamic/active behaviour; in contrast to being with a stranger, where they can be nervous and uneasy. The observation of the whole process continued to provide a major source of feedback. Afterwards both video films and cartoon films were compared by analysing the children's behaviours as shown in Table 6.1, to find evidence of the learning effectiveness.

(Equal opportunity monitor – taking turns)	
How many children's total speech duration is less than three seconds?	
How many children speak no more than twice?	
(Emotional usage monitor)	
How many types of facial expression are used?	
How many children use more than one facial expression?	
How many types of gestures are used?	
How many children use gestures more than once?	

Table 6.1: Observation of players for the control group and experiment group

Process

Initially, all the students in the study were addressed together. The teacher led a question and response session in which she introduced the concept of life changes. The students were encouraged to think of circumstances in their lives where they might face changes and to indicate how they felt they would respond to these changes. They investigated what emotions might be experienced. After this, the students were put into groups and created scripts for acting out stories related to the issues they had discussed (for example the arrival of a new baby in the family, moving house and so on.) The students were then placed in groups of mixed ability by their teacher and members of the groups were randomly selected to be placed in the experimental and control sub-groups. The control sub-groups then worked with the teacher to produce video films from their scripts, in which they acted out the parts, while the experimental sub-groups produced cartoon films, using the experimental tool.

In the experiment group, the major difference with the acceptance testing was that students had pre-built scripts and each script had around twenty-five pieces of dialogue. They were going to use them to produce cartoon films during lesson time.

Initially, each pair of students had to learn how to use the tool, as they had no previous experience. One pair of students tried learning a variety of functions by making a short film production. They quickly went through the expression decision-making screen and background environment choice but they spent much time on voice recording and making animation, an especially significant time being taken, since they repeatedly created many different facial expressions by using the face capture and facial expression design screen. In the end this short film production took them around half of the lesson time. They then started to follow their script to make a longer film production. They carefully produced their voice recording, however, they had to rush to make facial expressions and had no time to make animation in the cartoon film. In the end the second film production lacked expressions and gestures. Meanwhile, another pair had made four film productions because they saw their script as a guide for dialogue rather than a rigid rule. All four film productions were short but full of expressions and gestures.

The second part of the evaluation was carried out during a separate class period, in a subsequent week. All the groups of students viewed each of the cartoon films and video films and were asked to comment on how the films worked in allowing the emotions involved in the situations to be expressed. The students criticised both types of media freely. Of particular interest in this experiment was: how much were expressive voice, action and facial expression used in the production and to what extent were the students aware these were being used? The students were also encouraged to comment on the relevance of such expression. Comments made by the students and teacher were audio recorded, so that they could be analysed after the session.

6.3.2 Test two

Purpose

Test two was the development and improvement of test one in order to address the problems uncovered, gather more evidence of individual learning behaviour and evaluate students in terms of using emotional voices, gestures and facial expressions in the classroom when guided by supervisors.

Methodology

In test one some inappropriate arrangements in the experimental group were detected. The major problem was that pre-scripted dialogues were too long so that most students did not have enough time to carefully produce their films. In the new test the teacher asked students to create shorter examples. A further adjustment was made by the teacher regarding the voice recording in the tool and she added, "*All the children are lovely and very keen. They have all practiced their plays so when it comes to recording their voices they should be a lot better than the last films that we did as they know exactly what they are going to say.*" (Rebecca Stone- the SEAL teacher).

More evidence was collected to analyse the individual differences in the performances in the classroom testing. The teacher was asked to give simple comments for each participant's personality and personal ability, before the test. During the test, each participant's captured faces from the webcam, designed expressions on a 3D character, pre-scripted dialogue and their gestures used were recorded as evidence to support the behavioural analysis in Table 6.1. Their captured faces are not, however, presented in this thesis for purposes of anonymity as required by the ethics procedure.

This test used helpers to guide students in using emotions. Some previous observation results had shown that students were more committed in using various communication skills when they were guided. For example, in test one, one boy tried to express an angry voice but beneath his angry voice his laughter was detectable. A helper then suggested replaying the recording and listening to his own voice and he agreed that it sounded more like laughing and he was happy to record it again but with a more appropriate expression. A similar issue was also identified in the acceptance testing that a paired student, who received some suggestions from the teacher when they were recording their voice used their words and language skills in a more committed fashion. This test further examined this point.

The test covered the issue of exploring relationships, which was a recommended theme in the SEAL guideline. The teacher wanted the students to use two stories, these being a missing pen and a new family.

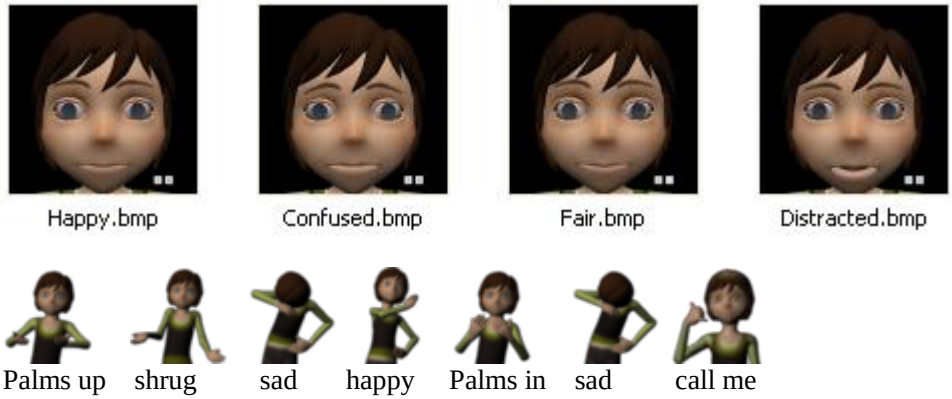
Process

Eight students attended this session and were separated into four pairs. Each pair was of one boy and one girl. Three supervisors, who were the teacher and two helpers, guided students in using their communication skills. Each pair had a copy of the dialogue which they had created in the previous lesson.

(*In the following paragraphs the phrase 'acted expressions' refer to use of a camera to capture real facial expressions and the term 'designed expressions' is used to refer to facial expressions created on a 3D virtual character by using the expression design*

system. Furthermore, the level of facial expression was classified as moderate, strong and extreme based on the expressed emotion.)

The first pair (pair-one) was guided by the teacher. The teacher commented that the boy in the pair was, "*fairly quiet. A really kind well behaved boy*". He acted and designed five expressions during the experiment. All his acted expressions were of moderate emotion and in some expressions, his eyes and head moved to enhance the feelings to be expressed. His designed expressions were also good and he moved eyebrows and mouth corners, to express feeling. In his acting he applied three gestures, these being, **'palms in', 'sad' and 'call me'** in the dialogue and all of them were used appropriately. The teacher commented that the girl, "always tries her best and is really lovely". When she was using the expression design system she could copy most facial features from the acted expression to the designed expression but she was not successful when trying to copy the facial feature of a frown and her acted and designed expression of 'happy' appeared to be less sensitive. From a general perspective her acted expressions appeared to be more emotional than her designed expressions. In addition, she carefully chose gestures and was confident in making her decisions and was especially good at using tone of voice when she was recording. The overall performance of this pair was good and teachers did not give them much guidance as they did this work very well. Figure 6.1 shows part of the evidence for this pair, pair-one.



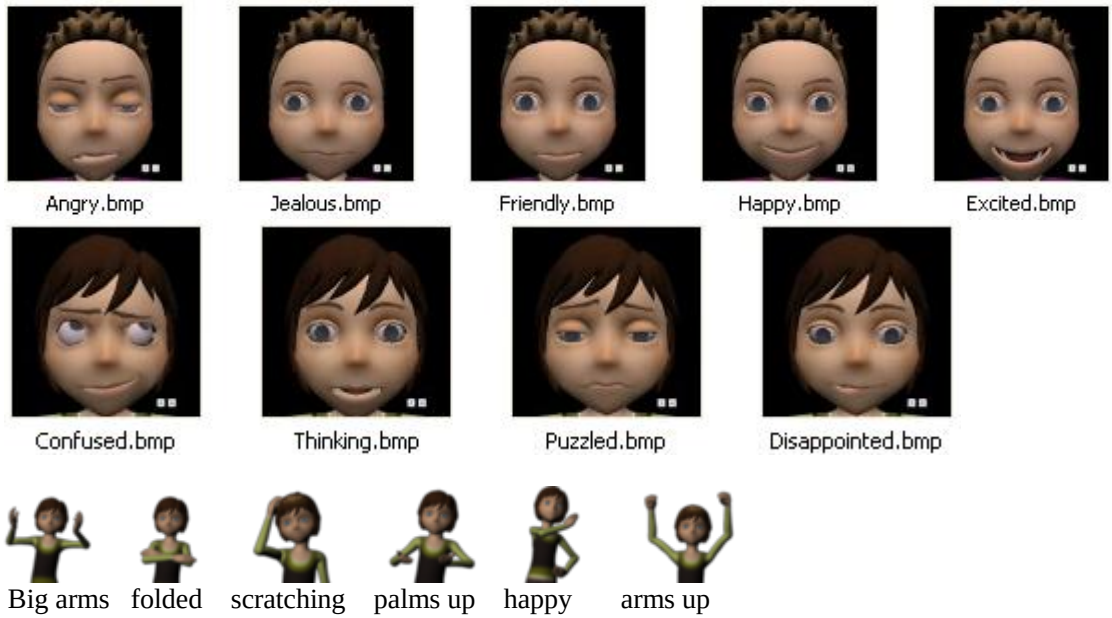
A new family by Player one (boy) and Player two (girl)

Boy: I'm glad you're leaving!
Girl: I don't care because I'm happy that I'm leaving.
Boy: Fine I don't care that you're leaving.
Girl: Good so we are both happy then.
Boy: I'm sorry I said those things I won't do it again. (Gesture: sad)
Girl: Ok but I still have to leave (Gesture: palms up).
Boy: Please don't, where are you going to? (Gesture: palms in)
Girl: I have to go because I have a new family. (Gesture: shrug)
Boy: But I'm going to miss you. (Gesture: sad)
Girl: I will miss you too. (Gesture: sad)
Boy: Can we keep in touch? (Gesture: call me)
Girl: Of course we can I'd like that. (Gesture: happy)

Figure 6.1: expressions and gestures in pair-one

The second pair, pair-two was guided by a helper, who was good at communication skills and also had significant teaching experience. The teacher commented that the boy in this pair was, *"very polite and tries his best"* and the girl was, "*quiet and hard working girl*". In the acted expressions, both of them were able to express strong emotions but they used different methods. The boy presented his feelings through the changes of the eyebrows and mouth shape, while the girl applied a combination of the movement of hands, head and eyes, to help her express feeling. When the girl started to design expressions she was told that the movement of the head and hands in the expression designing was not functional but she still worked out quite impressive expressions, which added the imagination of what she believed the expression should look like and the results can be seen at Figure 6.2. In the making animation task the

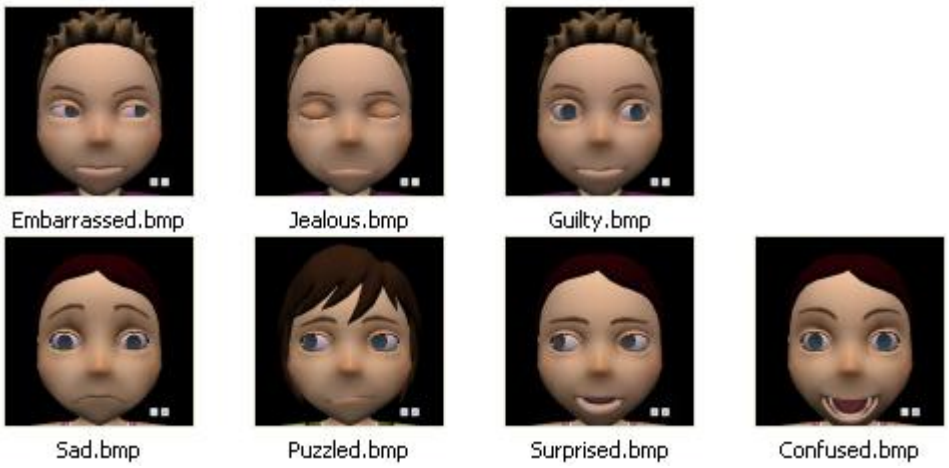
boy assigned gestures for every spoken section, at his turn, whereas the girl acted more cautiously but all gestures were used appropriately by both. Regarding guidance, the researcher had given some sample voices to stimulate them to talk more with feeling when using the recording system. When the students were selecting those expressions which would be used in the dialogue the researcher gave cues and tips to help them make decisions. The researcher especially praised their designed expressions for their creativity and this attracted other students to come and see.



A new family by player three (boy) and player four (girl)
Boy: I'm glad you're moving (Gesture: big)
Girl: I'm pleased that you're not going to miss me then. (Gesture: happy)
Boy: I'm glad because I don't like you. (Gesture: arms folded)
Girl: Well I won't be seeing you any more so you will be happy.
Boy: I'm sorry let's be friends again and forget this. (Gesture: big)
Girl: Ok but I am still leaving.
Boy: Where are you going? I said that I was sorry. (Gesture: scratching)
Girl: I have a new family to go to I am so excited. (Gesture: arms up)
Boy: Can I still see you? (Gesture: palms up)
Girl: Yes of course we can visit one another. (Gesture: happy)

Figure 6.2: expressions and gestures in pair-two

Pair-three was guided by the same helper as with pair-two. The teacher commented that the boy in this group *"struggles to follow rules. Can be quite immature."* and the girl, *"sometimes struggles with her work but does try".* In the acted expression, the boy tended to indicate extreme facial expressions, which could show strong feelings. These expressions were correct to use but also indicated immaturity. His designed expression appeared to be less emotional than the acted ones because in some cases copying of an expression from a real person to a virtual character needs some adjustment in order to display the correct expression but he was less concerned about this issue. In contrast, the girl designed expressions which were equally emotional when compared to her acted ones, as she did more than merely copy expressions. There was, however, some debate regarding the 'confusion' expression, as it seemed closer to 'happy'. In their film production only three gestures were employed. Of these one was used by the boy and two by the girl. During the experiment the researcher spent some time to put the children at their ease, answering their questions and giving hints regarding emotional usage. Under this guidance their recorded voices were indicative of appropriate emotions. The helper was also good at building relationships with the students and other pairs of students wished to discuss various problems with him or sought his opinion.




Shrug


sad


Scratching

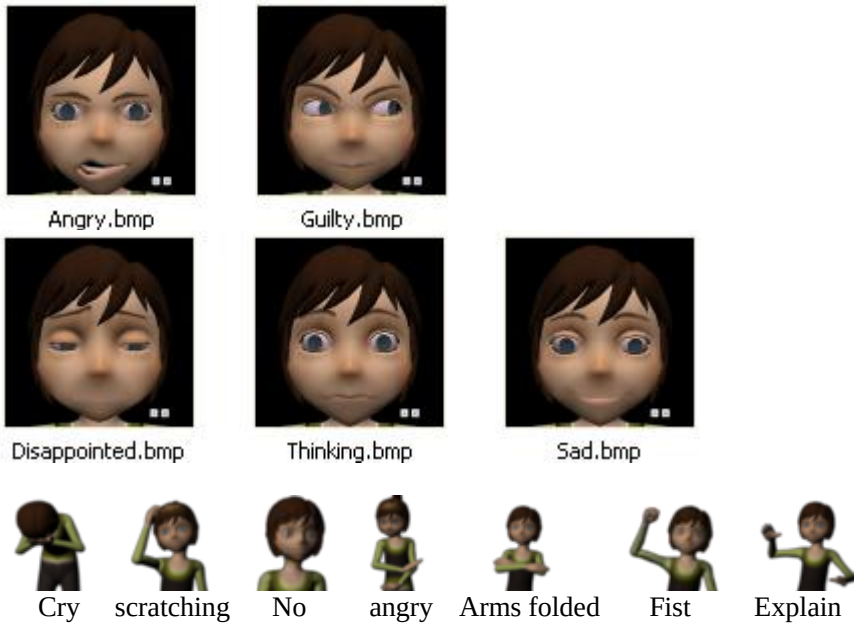
The missing pens by player five (girl) and player six (boy)

Girl: Have you seen my pens? (Gesture: scratching)
Boy: No, I haven't seen them at all. (Gesture: shrug)
Girl: Well that's strange as they were in my bag.
Boy: Oh do you think someone has taken them? (Gesture: sad)
Girl: I am not sure.
Boy: I feel guilty it was me. I'm sorry but you get everything that you want.
Girl: I will forgive you this time.
Boy: Thank you, I really meant it I am sorry.

Figure 6.3: expressions and gestures in pair-three

The fourth pair was guided by another helper, who had no previous teaching experience. The teacher commented that the boy was one *"who I work with and struggle with his work and to understand facial expressions"* whereas, the girl was, *"very confident and good at reading"*. The boy preferred to use extreme facial expressions, especially for bad feelings, both in acted and designed expressions. He managed two expressions, namely, angry and guilty. The angry expression was used well but the designed expression of guilty was a little more like angry. The girl acted three expressions and two of them were moderate emotions, whereas, another expression of thinking was rather strong, as she used a gesture to assist. Problems began when they started to record voice because the boy had difficulty in following the instructions and the girl had a little difficulty in targeting the mouse pointer over the record/stop buttons. The consequence was that their recorded voice contained many empty segments. In making the animation, they were able to give each other some suggestions, such as, "you can use this…" and would choose to assign every piece of dialogue with a suitable gesture, with most being used appropriately. In the whole experiment they had some arguments as the boy liked to take more time on his

work and found it difficult to take turns, while the girl wanted to be treated equally. The helper did not have the experience to cope with this competition, as the boy was apparently not happy when he was asked to stop. The helper tried to give some suggestions for the use of emotions but the boy simply ignored them and the girl seemed to come to her own decisions.



.
The missing pens by player seven (boy) and player eight (girl)
Girl: Have you seen my pens? (Gesture: cry)
Boy: No, I haven't seen them. (Gesture: arms folded)
Girl: Are you sure? (Gesture: scratching)
Boy: Yes.
Girl: Did you steal them? (Gesture: No)
Boy: Yes I did. But you get everything you want. (Gesture: fist)
Girl: No I don't, I bought them with my pocket money. (Gesture: No)
Boy: I'm sorry for taking them I didn't mean to do it. (Gesture: explain)
Girl: That's ok, but you did upset me. (Gesture: angry)

Figure 6.4: expressions and gestures in pair-four

There was a voice quality issue in this test. The previous tests had used a separate microphone but this test used a laptop inbuilt microphone instead. The results showed that the inbuilt microphone would allow too much noise in the recording process. It is

necessary to hold a separate more unidirectional microphone for the tool to be optimally used in the classroom.

6.4 Out of school testing

6.4.1 School Summer Scientist Week

This test was one of many research studies carried out during Summer Scientist Week 2011 at the University of Nottingham (See Appendix A.1).

'Summer Scientist Week is a free, fun event for 4- to 11-year-olds and their parents. Each August families are invited to spend half a day at the University, playing different games that help researchers understand how we learn and how our brains develop. There are lots of other fun activities such as computer games and face painting to keep children entertained.'(www.summerscientist.org)

Purpose

As discussed in Chapter Two, many teachers and researchers believe that both in school and out of school experiences are important in supporting children as regards communication development. In the previous classroom testing the chosen stories had to fit into the teacher's lesson plan and children were asked to follow the classroom instructions. In contrast, out of school learning, for example, at home, could be a child-centred environment, so that they would have greater autonomy to make their own decisions as regards play. This test was to observe children's behaviour in an out of school environment and to explore the impact the children's learning outcomes, such as the aspect of parental guidance.

Methodology

This test was one of the Summer Scientist Week 2011 research studies, thus some arrangements had to be made to fit into the rules of this event. A major limitation was that each session should not exceed 20 minutes but the previous tests had confirmed that each round of the filmmaking process could take up to 40 minutes. To reduce the time factor children were told to make short stories and they would receive direct instructions on how to use the tool, rather than exploring by themselves.

The stories used in the school and out of school settings were different. Three types of story had been prepared for the out of school study, these being: Topics for Discussion, Child-to-Child dialogues and Child-to-Parent dialogues. Topics for Discussion offered some guidance to indicate how to prepare a dialogue, based on a given topic. Taking 'The Weekend' as an example, children were asked to make a plan for the coming weekend and three questions were provided to guide them:

- What do you think of your previous weekend?
- Where would you like to go this weekend?
- Would you like to invite your friends to play with you?

Dialogues for both Child-to-Child and Child-to-Parent, used pre-scripted stories which were either collected from some children's websites or created by the researcher. Some stories used for Child-to-Child sessions were; *The mountain trip*, *Talk about the Animals They Dislike* and *The Missed Birthday Party.* Some stories for Child-to-Parent discussed things which happen in everyday life, such as, *Time for Bed, A Rainy Day, Homework and Movies*.

To address the purpose of this test, two arrangements were made to assess the

evaluation, under different conditions. The first arrangement was that children of all ages would be invited to join so that the operational ability of using the tool and the need for parent guidance could be associated to their age. The second arrangement was that some pairs were guided by their parents and some were not. The tool required two players cooperating to produce films and players could be either child-to-child or child-to-parent. In the child-to-child pattern, if two children came from the same family then their parent would be invited to guide them; otherwise children would work without parental guidance but the researcher would give them instructions and some help, if need be. In the child-to-parent pattern a child and his/her parent were invited to work together to make a film. The researcher's responsibility was to ensure parents understood how the tool worked and what the purpose of each screen was, so that they could guide their children in their own way. This arrangement was designed to understand the role of parental guidance, as contributing to children's learning and playing.

In this test children's behaviour was monitored according to the methodology from the acceptance test (See section 6.2.1). Parents were observed as to how they supported their children in resolving problems during play and how they taught their children, in terms of learning communication. Finally, parents were asked to give their simple comments as regards their overall view of this tool. Due to this test involving many sub-tests the evaluation has used some statistical methods to give more analysable results. Video recording was not allowed during the experiment but the film productions could be saved as evidence. This was linked with particular aspects, for example, players' ages, gender and whether or not there was parental guidance. There are also written records to describe each child's and parent's experiences.

Moreover, it should be noted that this event was organized by the University and parents who came to attend this event often positively responded to the education of children, and therefore, they might be more aware than most parents of how to help children learn.

Process

During the event each day was split into a morning and afternoon session and each session involved approximately forty children. The whole event lasted for five days and was held in two areas. One was the researchers' study area and the other was the children's play area. Initially, children came with their parents to enjoy some fun activities in the play area. Researchers then came to talk with children and invited a number of them who were in the target age range for their respective project to play some research-based games in the study area.

For the current research a total of forty-four children were chosen, comprising an equal number of girls and boys. Their ages ranged from four to eleven and the number of participants for each age can be seen in Table 6.3. Twenty-one parents were invited to participate in the test, plus one grandfather and one grandmother. All these children and parents were matched into thirty-two pairs: 11 pairs for child-to-child and 21 pairs for child-to-parent pattern. During the test, the learning outcome of each pair was appropriately associated with the children's age and the ability of parental guidance. The following will discuss common situations and some special cases that occurred during the tests.

Age	4	5	6	7	8	9	10	11
Number of children	2	7	5	5	10	8	3	4
Total	44							

Table 6.3: number of participants in each age group

Many young children, who were aged from 4 to 6 years old, expressed various difficulties in the use of the software and parental guidance was critical to their maintaining play and being stimulated to learn. For example a pair of five-year- old girls attended this test and were guided by their mother. At the outset their mother encouraged them to decide which story they would like to discuss. One girl said, 'fast food' and the other girl agreed. They then met their first problem in that both girls had some difficulty in reading the dialogue from the screen. The mother then decided to help them by reading every piece of dialogue and asked her children to repeat it for the voice recording. The children were delighted to follow this suggestion and their recorded voice was loud and clear. At the next screen they met the second problem where the children reviewed all expressions but they could not decide which were suitable to use for the dialogue and their mother had to make choices for them but in every decision she asked for the girl's opinion, saying for example, "what do you think…" The children were able to give their responses to show that they agreed or otherwise. After that the children spent a lot time on the expressions design process as the mouse control was difficult to operate and dictated slow progress but they did enjoy this part. When they moved to the last step – making the animation – 30 minutes had already passed and the children started to show impatience, looking around and showing restlessness. Their mother completed the work and the children

were less involved during this part. During the test children were sometimes distracted when someone came into the room and their mother encouraged them to focus on the game. At the end the mother commented that the playing experience was good and interesting.

With the pair of a 4 year old girl and her mother, the girl was obviously not able to complete the filmmaking work but she could participate to a degree, under parental guidance. In most situations her mother helped her to make decisions but she still experienced some of the key processes. For example, she was able to repeat what her mother asked her to say in the voice recording; she was confident to act her facial expressions in front of the webcam; she told her mother which gestures she would like to use. As the mother did the majority of the work most of the time the girl's interest was not high and sometimes she could be distracted.

During the whole period of Summer Scientist Week, only two pairs failed to make films and they belonged to the same age range. One pair consisted of a 4-year-old boy and his mother. The boy refused when asked to speak into the microphone, no matter how much his mother encouraged him. He was not willing to do anything except observe his mother working and fairly quickly the mother concluded that the tool was too difficult for her son to handle. Another pair comprised a five-year-old girl and a six-year-old boy and were without parental guidance. In the voice recording stage they made slow progress and struggled to record their dialogue. The girl had difficulty in reading the dialogue content which was displayed on the screen and spoke only intermittently during the recording process. Both had difficulty in using the mouse control and were unable to synchronise between speaking for voice recording and the

mouse click when to ‘start’ and ‘stop’ the recording. They played around for ten minutes and then the boy decided to give up.

A few children in this age range managed to independently manipulate the tool without parental guidance. A pair comprised of a five year old boy and a six year-old boy who came from different families worked together to make a film. The six-year-old boy was good at the interface operation and quickly learned how to use the tool. Meanwhile, he tended to test all the features that were offered, before he started to work. When the researcher praised his operational ability he said he had had a lot of experience playing video games. The five-year-old boy was less capable but could work alone and his partner helped him when he was in trouble. Initially they chose the story ‘fast food’ for the film script. They then took a little time to become familiar with the interface and use of the voice recording system. Once they understood the interface operation it was suggested to them that they try to speak emotionally in the recording and they tried hard but without much success. In the following step, the face capture and expression design, they seemed to grasp the concept quite quickly and this drew their interest. They were keen to act out expressions on a webcam and each expression was taken seriously, the result being that most of the acted expressions were very emotional and suitable for use. In the expression design, however, their interest seemed more focussed on having fun rather than ensuring that the designed expression was matched with the acted expression. For the gesture/posture usage they were confident in choosing gestures for the dialogue and all the selected gestures seemed appropriate. In the end, they took some time to arrive at a name for their film, which they finally called, ‘Chocolate Baby Head’. They kept laughing and there was no specific reason for the name. Nonetheless, they seemed to enjoy the experience and

remained fairly focused all of the time.

For children from 7 to 11 years old operation of the interface offered no significant obstacle and they tried to find out on how to produce an appropriate film. In most cases, perhaps not surprisingly, older children offered a higher performance in many respects. A typical example was a pair of eleven-year-old girls who, since they came from different families, had decided not to invite their parents, to avoid embarrassment in the guidance process. Initially the two girls decided to create their own story under the topic of 'breakfast'. They carefully read and listened to the instructions on how to create a story, then they spent around 40 seconds discussing what they were going to say for the story after which they picked up the microphone and recorded the dialogue instantly. They did not show any tension or hesitation but performed the dialogue as if in everyday life. When they were required to assign expressions for each piece of their dialogue they appeared to feel the need to improve their recorded voice to make it even more emotional and asked to go back and rerecord. The second recording was appropriately emotional and much better than the first and interestingly, they were the only one pair who asked to rerecord. When using the face capture screen, both girls were good at acting and often used gestures to make the expressions more emotional. Just as with the other pairs they showed great interest in the expressions design and acting process but they were able to exercise self-control, rather than losing themselves in the moment. As additional proof that they understood how to link the facial features appropriately with the acted expressions , at one time when they were designing expressions on a 3D character the amount of time for each expression design was equally assigned. In making the animation they used gestures wisely, not only because the gestures were chosen appropriately but they

made sure that every gesture appeared at the right time and in the right place, thus they thought it was important to decide when a gesture would start and how long it should continue. At the end they gave this film a name based on their story and called it ‘Making plans’. After the test the researcher informed them that their film was one of the best in this study. As a result they were rightly very excited and proud of what they had achieved.

Children’s attitudes and abilities were important in deciding how they would work on the filmmaking. A pair comprising an eight-year-old boy and his grandmother is an example. The boy had shown his ability to move the mouse cursor but most of the time he did not want to do it by himself. His grandmother tried to help him but she also had difficulty in using the mouse control. The researcher then discussed the issue with the grandmother and established a way by which the researcher would control the interface operation and the boy would make the decisions. Each time a decision was needed the researcher asked the boy’s opinion but the boy only responded to some questions and the grandmother had to consult the boy. After this she made the rest of the decisions. During the test the boy was involved in the voice recording and face-capture but preferred not to design expressions on his own, no matter how the researcher and grandmother encouraged him. In making the animations the use of some gestures which were decided upon by the boy were not appropriate but when the researcher explained this to the boy he just said he liked this gesture. During the whole period the boy merely watched but that did not mean he was not interested in the tool. In fact he remained focused all the time and both he and his grandmother said they liked the tool and would like to show the film to the boy’s mother.

Another example pair was a seven-year-old boy and his mother. From the beginning until the second expression design, the boy played seriously under his mother's guidance but after that he started to enjoy designing very emotional expressions regardless of whether the designed expressions were appropriate. In making the animation he was excited about the animated gestures or static gestures which expressed strong feelings and spent much time reviewing them one by one. The choice was made based on his personal interest, rather than on the gestures' suitability. The mother was happy that the boy was interested in something and she had no intention of correcting him.

In this age range parental guidance continued to be critical in ensuring the children have a positive learning experience. Many parents encouraged their children to express their emotions and some of them could associate with things which happened in their daily life. For example, an eight-year-old girl paired with her mother chose to use a prepared dialogue script called, 'Time for bed!' In the voice recording process the mother chose to record "Go to bed, now!", then she replayed this recording and thought it might be too angry but the girl disagreed; "Mum, you do say it like this when sending me to bed!" The mother wondered, "Did I sound angry?" The girl responded that she did, although she did not think that her mother was in fact angry; "Yes, you did!" Although the dialogue script was simple it had taken them much time to complete the voice recording as they had a lot of discussion on the emotional usage by the tone of voice. In the face capture screen the mother seemed a little shy to act out her expressions in front of the webcam. When the girl tried to persuade her mother to go first she refused and put the girl in the front of webcam. At the beginning the girl was also a little shy and nervous but soon became very confident and enjoyed the

experience. During the process the mother guided her daughter to make expressions with strong feeling, such as eyebrow movement. The girl often followed her mother's suggestions but sometimes she had her own opinions and debated these with her mother. In making the animation they showed great interest in the gesture/posture animations and reviewed all of them before they made their choice. If gestures caught their attention they would discuss each one and a choice would be made when both of them reached an agreement. Sometimes their discussion regarding gestures was extended to real life happenings. During the test the girl strictly followed the rules and focused all the time. The mother found her own way to inspire the girl and made the learning fun and relaxed. They seemed to be a pair of learners who helped each other, rather than one teaching the other. After the test both the girl and her mother commented that the tool was very good and impressive and they had enjoyed the experience.

All invited parents were happy to work with their children in all age ranges and most of them found an efficient way of guiding their children to learn but three parents were less able to guide their children. One such pair consisted of a six-year-old girl and her father. At the beginning, the father reviewed all the titles in the stories list and chose a story called, 'Dad, I have got some good news'. He did ask the girl's opinion but he did not choose to wait for the girl's reaction as he seemed to know the girl would agree with his choice. The father controlled the mouse operation most of the time and ignored the fact that the girl was also able to operate it. In the expression design the father controlled expression design but did not ask whether the girl would like to do it by herself. The expression design process was rapid but low in quality. He

ignored the girl's advice when she told him that some designed expressions were not right. In making the animation the girl told her father that she did not like a gesture but the latter still chose it based on his own judgement. In the test the girl was only involved in the voice recording and face capture but at other times looked on as her father played. The second pairing was a six-year-old boy and his father, both being quiet, resulting in no discussion or debate. The father did not actively guide the boy but gave a little help when the latter experienced difficulties. He seemed disinterested in using the tool and the boy also seemed to have little motivation to play. The test process was carried out in a somewhat negative atmosphere. The third grouping consisted of a nine-year-old girl with her mother. The latter played as a partner but did not offer any guidance even when the girl encountered some difficulties, there being no obvious reason for not helping her child.

The tool offered 24 pre-scripted expressions for common usage and most pairs selected their desired expressions from this list. Four pairs, however, indicated that they would have liked to have added new expressions, these expressions being, Bad, Pleading, Firm, Cross, Strict and Begging. When children were asked to allocate expressions to the dialogue, many of them preferred using different facial expressions to express a similar mood such as a set of happy, excited and loved and this often caused difficulties when they were asked to act and design these expressions, as they had difficult in distinguishing the difference between them and only a few parents were able to give an clear explanation.

Most pairs were interested in saving their film productions so that they could show them to other family members but unfortunately they did not possess a memory stick

for this purpose. On the last day of the event a parent asked if the film production could be sent via email and as a result the researcher found that the size of the film production was suitable for sending. In the rest of the tests the researcher asked four other parents if they would like to save their film productions and since they indicated that they would, the data was delivered by email. Three parents thought this was a good idea and gave their email addresses and one parent had a memory stick and saved the work instantly.

In this study, most parents gave positive comments and at least one third of parents thought the experience of using the tool, in terms of learning and playing, to have been excellent for their children. Four parents actively asked for the name of the software tool and considered using it in the home. Two parents commented that the playing duration was a little too long. Four parents gave no comment and also showed little interest during the play. Only one parent thought this tool was not suitable for her child due to the child being too young.

6.4.2 Home testing

Purpose

All the previous tests were supervised by at least the researcher who gave instructions and helped where needed. In the home environment, however, children will only get parental supervision and guidance. This test was a home evaluation, to assess children's behaviour using the tool in the absence of the researcher.

Methodology

There were three videos for parents: the software tool demo, the benefits for children

and tutorial for parents. These videos could help parents to understand how to use the tool, the purpose of the tool and how parents should be able to teach their children. The questionnaire, which was filled in by parents, was the only way used to access feedback. This questionnaire included three parts. This first part was used to collect basic information about the children, such as age and communication ability. The second part was for parents to observe how their children played with the tool. The last part was for comments from parents. The detail of this questionnaire can be found in Appendix A.2.

Process

A laptop with webcam and external microphone were provided for the parents. Parents learned how to use this tool either by watching videos or by being given a short demonstration. Three families completed this process but only two completed questionnaires were received. In the questionnaire the voice recording system was reported as being the most difficult part for the children whilst the most exciting part was the use of gestures and expressions to make the animation. Both parents reported that they found some opportunities to help their child in learning communication. One of them had written comments in the questionnaire saying that, *'My child is 5 years old and found it quite difficult to understand the tool but once he understands how it works he is happy to explore and engaged with tool'.* The parent who did not complete the questionnaire reported orally that her ten-year-old child had no difficulty in using the tool and engaged a lot but she was unable to guide her child as the child focused on the fun rather than on following her advice.

6.5 Summary

In this chapter, the evaluation process of using the tool at school and out of school has been described in detail along with consideration of the challenges met. In the classroom testing the tool was used to assist the teacher teaching, hence it was important to reach agreement as to the experimental details, such as the age of students participating in the experiments, which classroom themes could be linked with the tool objectives, how to evaluate the tool-based teaching approach and how to arrange access to the tool. All had to be integrated within the classroom teaching. In the out of school testing the tool could be more flexibly used by children, as they could choose their preferred topic and spend more time on what interested them. Parental guidance played a major role in guiding children as regards learning communication. Other issues which might influence the learning effectiveness were also explored, these issues being the children's age, general computer skills, personality and other abilities.

CHAPTER 7

Results and Findings

7.1 Introduction

Since all of the experimental processes in this study have been explained in Chapter six, this chapter concentrates on the analysis of the results and of how the experiments aimed to examine the three hypotheses. These experiments looked at measuring engagement, classroom teaching and parental guidance. The significant evidence is discussed to support the derived outcomes.

7.2 Engagement

The fundamental purpose of the tool was for children to design the 3D character animations for a film. During this process children used their knowledge and skills of speech, facial expressions and body language to produce an animated film. As described in hypothesis one the control/design of character animation was expected to stimulate children to use emotions so that they could express their own feelings more emphatically and in theory the greater the usage the deeper will be their understanding of these emotions. Hence engagement is the key and learning can be optimised when children are engaged.

Experiment	Place	Number of children
Acceptance testing	In school	6
Test solution	In school	6
Classroom testing - Test one	In school	8
Classroom testing - Test two	In school	8
Summer Scientist Week	Out of school	44
Home testing	Out of school	3
Total		75

Table 7.1: number of participants in each experiment

A total of 75 children (See Table 7.1) took part in the full set of experiments, which were conducted at different times and places. Most of them successfully made at least one film but two pairs did not succeed because of experiencing too many problems in using the software and thus they quickly lost interest. In addition, two pairs encountered the problem of software crashes and thus had no opportunity to complete the final film production. Most children engaged with activities provided by the software, as evidenced by the observations of their behaviour when using the tool. For example, many children were excited and laughed throughout the period of play and some were still excited after they had finished; many children were attracted by the pre-designed gestures/postures although they were sufficiently happy and self-motivated to review many of the gestures/postures before they made a decision. Some children frequently discussed with the teacher, helpers, researcher or parents in order to gain ideas from those adults; some children spent much time researching how to design an expression which was featured; some children had strict requirements of the voice recording, as evidenced by their repeatedly recording and then erasing the recording, in pursuit of what they wanted. Children's engagement was also confirmed by the

feedback from the school experiments. Almost every child agreed that they had enjoyed the experience and many indicated that they would like to have more opportunities to play. They thought the software was good and felt that no further improvement was needed.

It is certain that not every type of software will engage every child, as preferences vary and thus engagement levels will also vary. Research conducted in the Summer Scientist Week gave an opportunity to analyse what apparently affected children's engagement. The results indicated that children's use of and engagement with the tool could be associated with the following three aspects:

Age: Older children usually had a better understanding of how to use the software tool and they also obtained more enjoyment. Most children under six years old were not able to independently manipulate the software tool. They often encountered various difficulties such as reading text on the screen, interface operation, making decisions for facial expression usage and mouse control operation. Thus, they lost interest quickly and some found no entertainment whatsoever. In contrast most children aged from 8 to 11 years old became significantly involved in the film making process. They did their best to carry out each step of the process and liked to make a high quality product. Their designed emotions and usage decisions were good and appropriately adapted to the context of the story. They showed evidence of understanding the intention of the software tool and used skills to express their creative thoughts. These children had significant engagement with the activities since they used intelligent strategies to create a cartoon film and many of them were still excited after playing.

Social Adjustment: Children who had good social interaction found it easy to engage with the film production tool. The good social interaction in this thesis represents those who were capable to express themselves well. They can be good at using tone of voice, facial expression or gestures. If, however, child-to-child or child-to-parent were frequently discussed or debated, they will also been seen as having good social interaction. These children had usually already mastered certain skills for emotional usage and looked forward to exhibiting their talents. For example two girls recorded their dialogue using pleasant voices, which were also sufficiently loud and clear. They clearly understood that they were playing roles in the story and therefore they used tones of voice which were perfectly matched to the situation in the story. The researcher was impressed by their achievements, as many emotions were used but still the children were not satisfied and continued trying to make their recorded voices seem more suitably emotional. Obviously, children engage in matters at which they excel and are encouraged to self-improve. Furthermore, their sense of achievement led them to work hard on the rest of the filmmaking design.

Computer experience: Computer skills or the lack thereof, can sometimes restrict children's engagement. Many children, especially younger ones, have had less experience in using computers and the interface operations such as mouse control proved difficult. This almost inevitably lowered their motivation for playing as they had to spend quite a lot of time confronting such problems. In contrast, if young children are skilled at using computers they are very likely to have increased motivation to study in this way. For example as commented in a previous section one 6-year-old boy who had spent a lot of time playing video games had no difficulty in using the tool and was able to help his partner overcome difficulties with the interface

and both of them showed more engagement than other children of the same age but lower skill levels.

In school based tests 26 children took part and they all engaged with the film production software. This may have been because these children were older than 7 years. In the Summer Scientist Week, however, many younger children aged from 4 to 6-years-old participated and within this group there were seven children who obviously disengaged during the experience. These children had two common issues, one being that they met many difficulties regarding the interface operation and the other that the exploration of emotional issues did not seem to particularly interest them. For example, two five-year-old girls were excited to be invited to play with this tool and initially were able to focus on the screen and follow their parent's instructions but soon they become discouraged, as they experienced many difficulties with the interface operation and struggled to learn how to use it correctly. They did show a little curiosity regarding using emotions, especially when they had to act and design a facial expression but this interest soon waned. They became impatient, looking around and showing restlessness. Their parent tried to encourage them to go back to the screen but she was unsuccessful and had to substitute for her children to complete the remaining parts.

There was much evidence which confirmed that the design of character animation in a filmmaking process can offer children much enjoyment but there is an issue regarding engagement during the selection and use of emotions and the engagement of playing. Is this one and the same thing? In the area of game-based learning, the integration between games and educational content is always a potential problem because it often

occurs that children engage with game-playing but disengage from the educational content which is involved. Alternatively it could be that this integration makes the educational game less playable. This tool, however, did not involve the aforementioned integration, rather naturally the filmmaking process required designers to use characters with emotions and animate them. Children obviously enjoyed this process in itself and had high motivation to play. Hence, this tool did not need to use the game play mechanism or other irrelevant content to attract children's interest. It would appear that in terms of using the tool, there was a benefit gained as, in most cases, the engagement with using emotions and the engagement with playing were one and the same. Thus, if children engaged with the playing, then it seems reasonable to conclude that they must have been interested in exploring some aspects of the emotions involved. On this basis, it is believed that hypothesis one is confirmed for most children. Indeed the design of character animation was able to significantly engage some of the children. Some young children not being engaged with the tool does not mean that the design of character animation was unappealing, rather that a different operational interface which can adapt to their needs may be required to engage them.

7.3 Classroom teaching

Two tests (Test one and two) were conducted in the classroom, to study the assumptions described in hypothesis two, i.e. that the designed software tool and a corresponding teaching plan can help make learning communication effective and also meet the classroom needs. The main part of classroom testing was involved in Test one. Test two was a complementary test used to check the corrections introduced in

response to some problems which had appeared in Test one and to collect evidence of using emotions when these were guided by supervisors.

Test one was designed to compare two teaching methods: acting-based teaching and tool-assisted teaching, both methods involving the production of films. In the acting-based teaching approach, the children are the actors and they are video-recorded performing their plays. The tool-assisted teaching produced a cartoon film, with the children providing the voice acting and choosing the animation and scenery for the film. At the second session both the videos and cartoon films were watched by the children. In general they felt that the cartoon films lacked conflict in the story line, compared with the video. The major reason was apparently that using the cartoon tool required more time than using the actors so that children lacked the time to produce long dialogues in the cartoon, thus leaving them incomplete. The length of the prescribed dialogues was suitable for the actors to perform but inappropriate for use by the cartoon tool. After discussion with the teacher Test two addressed this problem by the use of short dialogues of about ten lines each. These dialogues were short but full of storyline and the result was successful as all pairs were able to complete their cartoon film production within a lesson and furthermore, they had enough time to explore the emotional usage.

According to the behaviour monitor form in Table 6.1, the outcome of evidences for taking turns and using emotions can be seen in Tables 7.2 and 7.3. Every child should have equal opportunity to take part in the classroom activities and speak out using their own voice. However, the evidence listed in Tables 7.2 and 7.3 shows that in the control

group around one in five of the children did not have sufficient time to express themselves. They either spoke for less than three seconds or no more than twice. In contrast, every child in the experimental group had sufficient time to speak and make their decisions of using emotions as the tool was designed to act out a dialogue which desired two children to take turns.

The monitor of using emotion had shown that in the control group, each sub group used only two to three types of expression but children in the experimental group used at least five different expressions and this could up to nine. Furthermore, only 23% of the children used more than one expression and 14% use more than one gesture in the control group, while every child used more than one expression and gesture in the experimental group. A further statistic of the average usage of expression and gestures for both groups can be seen in Table 7.4. It is clearly shown that the opportunity for children to use facial expressions in the experimental group was eight times higher than that for the control group. Also use of gestures was four times higher in the experimental group than the control group. However, it should also be noticed that the measurement of the control group may have some deviations. This is due to two reasons: 1) the author may not have been able to detect the micro facial expressions from the video tapes; 2) the observed facial expressions and gestures had to depend on the author's experience to distinguish them and thus it is possible to have different views from others. While such variation in assigning use of expression may have some importance it is clear that the evidence strongly indicates the better performance of the experimental group over the control group in the area of using emotions. Moreover, the further analysis in the following will continue to support this outcome.

Control group					
	Group 1	Group 2	Group 3	Group 4	Total
The number of children in each group	5	5	5	7	22
(Equal opportunity monitor – take turn)					
How many children's total speech duration is less than three seconds?	2	0	0	2	4
How many children speak no more than twice?	1	0	2	2	5
(Emotional usage monitor)					
How many types of facial expression are used?	2	2	3	3	10
How many children use more than one facial expression?	1	1	2	1	5
How many types of gestures are used?	4	3	6	3	16
How many children use gestures more than once?	1	0	1	1	3

Table 7.2: emotional usage and take turns in control group

Experiment group					
	Group 1	Group 2	Group 3	Group 4	Total
The number of children in each group	2	2	2	2	8
(Equal opportunity monitor – take turn)					
How many children's total speech duration is less than three seconds?	0	0	0	0	0
How many children speak no more than twice?	0	0	0	0	0
(Emotional usage monitor)					
How many types of facial expression are used?	9	9	7	5	30
How many children use more than one facial expression?	2	2	2	2	8
How many types of gestures are used?	7	6	3	7	23
How many children use gestures more than once?	2	2	2	2	8

Table 7.3: emotional usage and take turns in experiment group

	Control group	Experiment group
Facial expressions	0.45	3.75
Gestures	0.72	2.875

Table 7.4: the average usage of expressions and gestures for both groups

The acting groups had to perform their story in front of other children (the other sub-groups of the control group). Some children appeared nervous and they concentrated on what they were going to say but overlooked the need to consider using gestures, body language and expressions. Making the cartoon film, however, naturally required the dialogue to be broken down into several parts. The children's recording, choosing and designing their expressions and choosing their actions, as well as applying these, was worked out in different time stages. They had time to consider what expressions they would use and how to express them using the tool. For example, a boy who decided that there was a happy expression in their dialogue acted his own 'happy' expression in front of the webcam and his partner helped by clicking the capture button to save this expression as a picture. Then the boy used this picture to help design the happy expression on the 3D character. He deliberately chose to move the eyebrows, move the corners of the mouth and open the mouth. In the whole process of expression design he thought about how to make his face look happy and learned how to make a 3D character's face look happy.

During the feedback session with the children a number of important issues were raised. The children involved in the acting were naturally very aware of being watched by others and were less inclined to actually analyse the communication process (as presented in their own films), than those who had made the cartoons. The value of being able to add a background scene to the cartoon films was also noted. This led to some discussion as to how they could have done this for their own films (using a green screen). Several children noticed the fact that gesture had been used extensively in the cartoons but that it was absent from the other films. Both groups showed great enthusiasm for commenting on both types of film and obviously enjoyed the process.

The use of the cartoon tool could thus allow the children to think about some new perspectives of communication related issues and encouraged them to discuss the process further. One of the significant features when using the cartoon tool was determining the context of the conversation. Both children and teachers appreciated the fact that they could discuss the right place for the topic.

As the tool allowed the children to have time to consider and focus on what gesture could be used in their dialogue it was possible for them to spend time understanding the effect of gesture on the communication process. One team used many gestures and added a gesture in each episode of the dialogue. Most children thought using many gestures was good for emphasising the communication aim of the dialogue, however one boy, who had been in the experimental group and had used few gestures, commented that he felt that too many gestures were used in the other cartoon films.

One child, who had been identified by the teacher as having Attention-Deficit Disorder (ADD) was particularly uncomfortable in front of the video camera and tried to avoid being captured. He was not alone in this, however, and few of the children were confident to act out their stories in front of other students. Nervousness, embarrassment and other negative feelings were apparent and some children appeared to find the process quite stressful. Although learning presentation skills in the public domain is a vital communication requirement it is also important to provide an option for children to practice their communication skills in a private space, with a small group, before they have to speak in front of others. The cartoon tool supplied the children with the

option to practice their conversation in a virtual environment while they made cartoon films and thus receive comments, without needing to face the pressure of public presentation. The experiment result also demonstrated that the children who were involved in using the cartoon tool were relaxed and apparently enjoyed the experience.

Evidence of emotional usage was specifically listed in test two so that the cartoon tool allowed children the opportunity to express different emotions, whilst in the same mood. For example, positive feelings in a sentence can use such expressions as ‘happy’, ‘excited’, ‘loved’ and many more. Visual expressions of these emotions can seem quite similar and it was not easy to differentiate individual faces designed by the children and thus this was not always clear in the acting process, but by using the cartoon tool the children could more easily pay attention to these details, in order to differentiate. For example, a girl identified a feature of the difference between ‘puzzled’ and ‘confused’ being the eye position, where ‘puzzled’ was looking down, and ‘confused’ was looking up (See Figure 6.2).

Observation from the control group had shown many children who performed in front of other students were expressionless. What then were the reasons preventing them from using expression? They might have been under pressure, had insufficient time for preparation or have lacked the skills or knowledge. It was difficult to know the precise reasons, however, using the cartoon tool gave them an opportunity to analyse this communication process and establish any weakness among their tone of voice, gestures and facial expressions, so that teachers could provide targeted assistance to serve the children’s needs. Ideally, supervisors, such as teachers, would accompany the

children throughout the whole process and would help children to resolve any arising communication problems. This was done in Test two, where three supervisors guided four pairs of children. The result was that some communication problems were identified in the process. These problems were not necessarily a matter of right or wrong but their consideration allowed the children's communication skills to be further improved, as evidenced by the fact that, frequently, the children were able to perform better if they were given suggestions. In addition, communication issues were not always raised by supervisors but by the children themselves, who discovered problems or sought a better solution, as they often asked questions and liked discussing their ideas and thoughts with someone in whom they had confidence. In this case, the supervisors clearly had a good rapport with the children, which significantly facilitated the process.

As a teaching assistance tool the design should address some classroom needs, the first of these being the 'flexible titles'. It is often stated that teachers would like to follow teaching strategies provided in the curriculum guideline but would also wish to have the right to make any necessary adjustments. Bearing this in mind, in Test two, the SEAL teacher was told that the experiment could be conducted as a component in a SEAL course and would be suitable to the theme of *'relationship'*. She also agreed that she was going to follow the, *'Yellow set resource sheet: Year 3',* from the curriculum guideline. In this resource, three stories were suggested: *'man in court'*, *'the missing pen'* and *'a new family'*, however, the teacher did not wish to use the *'man in court',* as she though it was not suitable for discussion by the children. This illustrated the fact that teachers prefer that the title of stories to be used should be decided by them. To

adapt to this need, the design of the tool gave the children the option to create their own stories and this satisfied the concerns of the teacher.

The second need to be considered is, 'the relevance of teaching content'. Although teachers can use flexible approaches to teaching children, they feel bound to use approaches which should help children develop the appropriate skills, as demanded by the curriculum requirements. In the early contacts the SEAL teacher stated that her lessons should follow the national curriculum guidelines and provided a copy of this guideline. According to this course requirement the usage of facial expressions in the tool was considered to be the most relevant to the requirement with the tone of voice and body actions being less of a priority. After the tool was demonstrated to the teacher however, she indicated that all these forms of exploration of emotions should be suitable for her SEAL course and was happy to see it as an extensive way of exploring emotions.

The last need to be considered was the, 'the management of play duration'. The original plan was to ensure that the children were able to produce a film within a single lesson period, so that the teacher could easily add this tool to their lesson schedule. Although many efforts had been made to reduce the duration of the filmmaking, it still ran beyond a period, unless the children worked on a short story. For this experiment, the teacher could accept the use of short dialogues to create the films, however, for the long-term, there needs to be a better solution. The teacher thought that using the tool for a longer period, including perhaps time to train the children in the use of the tool throughout the whole semester, would help address this problem.

The tool offered a new vision of learning communication in the classroom. Compared to the conventional teaching method. There was no obvious reason for supporting either method exclusively, however, this new method brought some positive effects, which had not previously been available and children engaged with both the novel and more traditional methods. As a result, it is recommended that the tool can be combined with conventional teaching methods so that they can complement each other. Furthermore, Hypothesis two also stated that the tool may fulfil specific classroom needs, for example, the tool would be suitable for use in the classroom but there was the problem that if teachers wished children to act a long dialogue by using the tool, it seemed likely that this could not be contained within the time-scale of a single period. More importantly, it is acknowledged that a long dialogue was usually necessary for children to create a complex storyline.

7.4 Parents/Guardians as learning guides

According to Hypothesis three, by using this film production tool, children have the opportunity to express their ideas, thoughts and feelings, through the manipulation of 3D character animation. Parents/guardians can observe the process and help their children, if the latter make inappropriate decisions. To examine this hypothesis an experiment was designed to establish any difficulties children might meet and how their parents/guardians would guide them. Furthermore, it was important to establish any problems which parents/guardians encountered when guiding, such as, if children feel annoyed when parents/guardians told them what to do? Could parents/guardians convince children to follow their suggestions?

Parental guidance was meant to help children overcome problems, thus, what was the nature of any such problems? The majority of younger children encountered problems relating to the usage of the software tool and parents' support focused on how to help their children follow instructions and complete tasks for the filmmaking. As regards the use of emotions, parents were happy to see their children using emotions but they usually did not actively ask the children to use them and often ignored the fact that their children did not perform well in terms of the tone of voice and designed expressions. For older children many had shown willingness to explore the use of emotion in-depth. Parents generally were prepared to offer their opinions and to point out children's mistakes but such intervention depended on their children. Some commonly presented problems in emotional usage in the use of the tool were:

1) When children were asked to act out an expression in front of the webcam, some found a few expressions difficult to act, for example, 'confused' and 'fair'.

2) Some children were good at acting expressions but experienced problems in designing an expression, as they often forgot to create movement in some key facial features.

3) Some children needed support to make a decision, when asked to choose an expression for a particular piece of dialogue from the expression list, due to some expressions having similar meanings.

In particular, many children were emotionless in their recorded voice and it was unclear if parents noticed this problem. The fact was, however, that many parents

appeared unconcerned regarding this issue. Rather they were apparently more concerned as to whether their children could speak continuously and be loud and clear.

Every child clearly understood the difference between the basic emotions and none made a mistake in distinguishing the difference between ‘anger’ and ‘surprise’ but they frequently were confused when trying to differentiate between more closely similar expressions, for example as regards ‘puzzled’, ‘confused’ and ‘surprised’. They received little help from their parents as it seemed the latter also had difficulty in clearly differentiating. Most parents simply encouraged their children to think and make a decision and were apparently satisfied with whatever decisions were made by their children.

The children enjoyed this process of being guided and seemed to prefer following parental guidance, such as discussion and advice which was often provided when difficulties were encountered. More importantly, some guidance enabled the children to explore various possibilities of emotional usage and further raised their interests in playing. In the experiment, although parents had not been informed as to how to guide their children, most of them clearly understood what was required and were able to offer the appropriate suggestions. These suggestions basically required children to think and make decisions. For example, in, ‘a rainy day’ story, a mother found her daughter was uncertain as to which expression should be used for the sentence, “But it has stopped raining, mummy”! The mother reviewed all the expressions offered in the expressions list but she also could not find an appropriate one but still encouraged her daughter by suggesting she imagine the situation in real life and think of what

expressions she would then like to use for the sentence. The girl thought for a while and answered, “Pleading”, to which her mother responded, “Are you sure”? The girl then replied to the affirmative.

From the view of the experimental results there were differences amongst the degree of parental guiding ability demonstrated. More than half the parents demonstrated that they had the ability to inspire their children’s thinking and decision-making. They closely worked with their children throughout the period of play and their guidance was critical in encouraging their children to have their own ideas regarding the use of emotions, however, some parents met with problems, for example, some parents tried to give advice but were ignored. After several opportunities to work with the tool, the parents seemed to lose interest, which was further confirmed in a Home Testing experiment, where a mother indicated that although her ten-year -old son enjoyed playing she was no longer prepared to guide him. A few parents were satisfied with whatever decisions their children made, even when some children made obvious mistakes. These parents apparently saw no difference between an educational game and an entertainment game. They watched their children playing and encouraged them but made little or no effort to guide them. As a consequence these children often focused on some functional design aspect which caught their attention and were less concerned with how to make a quality film. Moreover, some children seemed unable to think for themselves, as they simply followed whatever their parents told them to do, without there being almost any debate.

At the end of each testing session, most parents gave positive comments and at least one third of parents thought the usage experience of the tool, in terms of learning and playing, to have been excellent for their children. Four parents actively asked for the name of the software tool and considered using it in the home. On the other hand, two parents commented that the playing duration was a little too long and four parents gave no comment and also showed little interest during their children's playing with the tool. Only one parent thought this tool was not suitable for her child, due to the child being, in her opinion, too young to benefit.

In general, around half of the children in this experiment had the benefit of learning some aspects of communication skill under parental guidance but this benefit was limited for the rest of the children due to two major problems which occurred in the guiding process. The primary problem was associated with the children's age. Young children (especially 4 to 6 year olds) spent much time struggling to master interface operation problems and parents usually focused on helping them resolve these problems and showed less concern for their children to be using emotions. The secondary problem emanated from parents themselves, as not every parent was good at guiding and some met problems when they were trying to guide their children. In terms of an example of home used educational software, most parents liked this film production tool and those who were good at guiding showed even greater enthusiasm.

7.5 Summary

After discussion regarding findings the three hypotheses are thought to be reinforced in most situations. The film production tool can engage children both in learning and playing and the design of character animation stimulates many children to explore their

feelings. The tool brought some unique advantages in learning communication in the classroom, when compared with a more conventional teaching method. The tool is, however, currently unsuitable for use in connection with acting a long story due to the limits of if time available during the normal lesson period. The majority of parents thought that the tool was beneficial for children and many of them enjoyed the opportunity to guide their children in learning communication skills and had fun with their children. Some parents confirmed that they very much enjoyed the experience provided by helping their children to use the tool. The tool is, however, not ideal for use by young children as the interface operation is too difficult for them to understand and manipulate. The optimum age range for primary children is 8 to 11-years old but it is still potentially of considerable benefit for children in the age range of 6 to7-years.

CHAPTER 8

Conclusions

8.1 Summary

The aim of this thesis was to explore hypotheses based on the idea that the production of animated cartoon films would have unique benefits in teaching young children about communication processes such as the use of expressive language, emotional tone of voice, appropriate facial expressions to communicate emotions and body language to enhance the communication of meaning. It was believed that this would work because the creation of such a cartoon animation would require the children to focus directly on these issues. It was therefore a necessary objective of this work to establish if appropriate tools for this already existed or if a focused tool could be valuable to develop. In addition it was desired to investigate if using such a tool could aid the teaching/learning of such communication skills both in and out of school. To lay a foundation for these objectives a literature review was undertaken from three perspectives. Firstly, as discussed in Chapter Two, the review explored the development of children's communication skills and established what factors might influence children's learning and how other researchers and teachers supported children, especially those who were judged as SLCN. Secondly, the review explored how other educational software was developed to support children learning communication skills. The use of Moving Images for telling stories was considered as it had great potential benefits for learning communication but to date this technology had not attracted sufficient attention thus it merited detailed investigation. Finally, the

benefits and challenges of Computer Aided Learning (CAL) and game-based learning were explored. The advantages of using both CAL in general and game-based learning in particular were investigated. From this review the numerous concepts were gathered to aid understanding of how software development for film production and specifically the particular needs of educational software in the classroom might best be undertaken.

As was mentioned above it was believed that a film production tool that engages children in some steps of the animated cartoon filmmaking process would enable them to learn important communication skills. After careful consideration the design of character animation was thought to be the most appropriate aspect to consider in supporting primary schoolchildren in learning how to express their feelings. The details of the essentials of the software development were guided by the professional film production process but how to fulfil the needs of both children and teachers was also considered. Some theories which were also beneficial to the design of the film production tool were discussed.

In the experimental stage both in school and out of school experiments were conducted to test the hypotheses described in Chapter One. The classroom experiments in school tested the efficiency of the film production tool in assisting teaching in the classroom. The out of school aspect, which included tests undertaken during the Summer Scientist Week and some home testing, were used to examine children's performance and the efficiency of parental guidance in the out of school environment.

8.2 Contributions

The contribution of this study can be summarised as follows:

The first hypothesis states that if you let children be involved in the design of character animation in the filmmaking process it will significantly engage them to explore how to express their feelings and emotions. The evidence obtained from in and out of school tests suggests that the majority (90%) of children were, as described in this hypothesis, engaged to explore the usage of emotions and at least one third of children expressed extreme engagement behaviours during play. However, it should also be noticed that some young children who were aged from 4 to 6 years old displayed disengaged behaviours (about 10% of the total). What will influence children's engagement levels? The result from the Summer Scientist Week had shown that this was often associated with three aspects which were, age, social adjustment and computer experience. Young children had disengaged behaviours because of their lower computer skills and social adjustment. They need a new way of interface operation to meet their needs rather than the design of character animation being unappealing for them.

The second hypothesis states that teachers can use this software to assist teaching in the classroom because this film production tool will offer an effective method to learn communication and it will also meet the classroom needs after proper design. The effects of tool-assisted teaching were measured by comparing it to a conventional acting-based method. The results showed that both methods were able to engage children but the former brought some positive effects which students had never experienced before and enriched the exploration of use of emotion and created opportunities for new topics of discussion. Meanwhile, the design of the tool and its

arrangement could fulfil the classroom needs in the SEAL course except for a problem that it was not suitable for acting a long story, as this would require time beyond the standard lesson time but the use of short stories was accepted. So far the results of classroom testing supported the hypothesis that tool-assisted teaching can be valuable and integrate into the teaching process but it still depends on teachers' preference as to whether or not they would like to use the new technology.

The third hypothesis states that development of character animation has the power to build a connection between adults and children, so that parents (or guardians) can offer their advice to help children learn communication skills in the home environment. The out of school experiments involved 47 children and 26 parents/guardians. The results illustrated that around half of the children had positive reactions to accepting guidance from their parents. Especially, some parents became very engaged in play, so much so that not only did they offer guidance but worked closely like a partner, to share the experience and enjoyment. The remaining children, however, seemed to benefit less from the process. The problem seemed to stem from the parents, indicating that not every parent has good guidance skills. This result is unsurprising as parent's professional, social skills and relationships are likely to affect their views of teaching and their relationships with children can also affect the effectiveness of their guiding. The problem also derived from the children themselves as some, especially the younger children, found the tool difficult to use so that parents mainly were concerned with their children's ability to learn how to operate the interface rather than guiding on using emotions. To be valuable as a home learning activity it is not necessary and also impossible to serve every parent and children's needs. The important thing is that this activity is valuable because it helped many

parents engage with their children learning communication skills.

8.3 Future work

8.3.1 Multiplayer

This film production tool was designed for two children working together to produce the films and the SEAL teacher thought this arrangement was suitable. According to the outcome of the observations of some SEAL lessons, however, the preference of the teacher was for small group discussion involving between four and seven children in each group. Some apparent advantages of this approach were: 1) the teacher had sufficient time to take care of each group and help them resolve problems; 2) children had more opportunities to learn ideas from their partners and the discussion and debate became more frequent, especially in that some children demonstrated their leadership in prompting others to participate and take turns. These advantages, however, are also critical to promote future further use of the film production tool. Hence, a further development of the tool is suggested so as to satisfy needs of children in a group, as well as multiplayers.

This further development should, however, not simply involve more children who will take turns to go through the entire process of filmmaking as this would involve taking a long time to produce a film. The tool for multiplayers needs a novel procedure which can, nonetheless, relate to the reality of professional film production, which is itself a cooperative work. Thus, this novel approach requires the construction of a non-linear filmmaking system in which each child can work in a different part of the filmmaking process at the same time. For example some children could be responsible

for the voice recording and some manage the expression design. At the end of the process their individual efforts will be combined to make a cartoon film. To apply this in the classroom each group needs a leader who is able to assign tasks based on the individual abilities of the participants and the leader has to make sure that the whole process can be completed within the scheduled time. Within this process it should then be possible for each group to produce a longer film with a more complex storyline and yet can be completed within the lesson time. The aspect of learning being concentrated on by a given child could then be tailored to their needs as they would be asked to focus on whatever aspect is assigned to them. Taking tone of voice as an example, regardless of whether children have the ability to speak emotionally they would at least be given the opportunity to take more time and energy considering how to speak with the correct vocal intonation to match the appropriate emotion for the part of the story as required by the operation of the tool.

8.3.2 Editable tool for teachers

'The introduction of a third party, the computer, into the situation encourages the teacher to play the role of a coach, in much the same way that a piano encourages the teacher to play the role of a coach in a piano lesson. Much of the learning is meant to take place between the student and the computer, so the teacher becomes an observer and a guide who ensures that those interactions are beneficial to the students' learning'. (Collins, 1991)

Collins stated that this role shift from lecturing to coaching was not easily accepted by teachers, as they were the knowledge givers and many would prefer remaining as master of all activity in the classroom. To increase the likelihood of adoption by

teachers the film production tool was designed to fit in the normal teaching plan and method and in this study the SEAL teachers were happy to use it in their classroom. To further increase teachers' confidence, however, a future development suggested is that some functional modules in the tool may be edited by teachers, so that they are able to teach children based on their preferences. It is common that teachers have little computer knowledge and have little time to support complex editing but some easy and quick impact outcomes should be sufficient for their purposes. Teachers need to feel that they control the situation in helping children, rather than just rely on software.

The following are recommendations for the editable tool but not limited to this:

The 24 expressions to help children make decisions in the use of emotions in each piece of the dialogue were presented in the expression list in the tool offered and these expressions were sufficient for the basic usage but children of different ages need different challenge levels. For example, some older children would like to use intense expressions such as strong anger or expressions such as being serious or anxious; Young children were often concerned about and hesitant regarding using expressions that were similar to each other such as afraid, scared and frightened. It is suggested that teachers should be able to edit this expression list and decide the expressions to be explored based on the children's needs, chosen stories and lesson requirements.

Sample expressions indicate to the children how to act a facial expression in front of a webcam and this did help many children to learn and understand an expression, for example, one boy asked his parent how to act the expression 'confused' but his parent apparently was unable to explain and just asked the boy to look at the chosen sample

expressions and act in the same way. The current store of sample expressions were, however, not sufficient to support the required variety of expressions and moreover, different people had different preferences regarding their favourite expressions. It is suggested that teachers should be able to add/delete the storage of sample expressions, so that they can decide what is best for their students.

Everyday gestures/postures have been used but there is no systematic way of indicating what might be suitable for children to learn. Some body language actions are used frequently but some are unpopular; some are aggressive; some may lead to a misunderstanding in different cultures; some have significant meaning, whilst some are apparently meaningless; some have multiple meanings when they are used at different times and in different contexts. Apparently, not all body actions are suitable for children to learn and use. The tool included basic versions and many of these were positive, popular and meaningful but there is still no guarantee that all teachers will have the same view and accept the appropriateness of the expressions. It is thus suggested that the tool could offer teachers a large number of gestures/postures and allow them to decide which of them would be appropriate for their students.

8.3.3 Secondary aged children

This study focused on primary age children but it would be interesting to further explore the performance of secondary-aged children. The previous work discussed in Chapter Three confirmed the format of using filmmaking for learning was also liked by secondary aged children and more importantly they were able to handle more complex work in the filmmaking process, enabling them to further explore the nature of emotions. For example, they can learn how music affects the mood; they can create

an atmosphere by setting lighting, camera and environment; they learn the importance of a person’s appearance, such as how mode of dress affects other people's views and they can learn how to speak appropriately, according to the occasion. In the film production tool developed in the current work children can decide the appearance, time and place of a gesture in a dialogue by manipulating the beginning and ending of a gesture on the timeline, however this feature was not apparent to most of the primary school children during the experiments. Two 11-year-old girls were, however, aware of the importance of the timings and set them correctly. It is expected that secondary school age children would have more awareness concerning this aspect of the animation task and would want to use it in pursuit of producing a high quality film.

8.3.4 Some important design improvements

The tool offered many predesigned gestures and postures and children were attracted by the variety of body actions but few of them had the patience to read the explanation for each body action. Children often made a decision quickly and most of the time these decisions were acceptable, as the usage of body actions often depends on individual preference and there is no absolute right or wrong use of many actions. In the future development it is suggested that more challenge for children be set so that they need to think carefully when they make decisions. A possible way of achieving this would be to have body actions which are designable. The experiments confirmed that children were particularly interested in the expression designing system. It would be valuable in engaging and challenging children if the body actions could be designed in a similar way. Character animation design in the industry is worthy of exploration as much can be learned from it. There are two common ways of

approaching animation design: motion capture and keyframe animation. Motion capture can capture true-life animation, through the use of multiple cameras and retargeting animation on 3D characters. Developing a suitable system for children may prove difficult and potentially too expensive. Keyframe animation involves manually designing every movement in the important frames, which requires professional knowledge and skills in the animator and is also very time consuming. Using a limited version of keyframe animation might, however, supply children with a suitable tool for designing body actions. For example, the animation of 'hand waving' can be seen as a combination of three actions: hands up, palm out and waving.

Feedback from questionnaires and observation illustrated that the voice recording system was the most difficult part for the children to use. The difficulty of this interface operation was noticed in the acceptance testing and as a solution both oral and text instructions were used to explain how it worked. This solution did help some children establish correct usage but many others needed a better solution, because the problem was not only the understanding of the interface operation but the children being asked to be skilful in operating the interface rapidly and sensitively in order to avoid noise being introduced into the recording process. Many, however, did not have sufficient experience of computer and recording use. As a consequence they needed time to locate the recording/stop buttons and also needed time to target the mouse cursor on these buttons; they needed several attempts to establish what to say next when they were recording a long sentence; many of them began thinking about how to say it after clicking the recording button. For these reasons many segments of empty recording were included in film productions. Although supervisors (the researcher, teachers, helpers and parents) did their best to help children some children still found

the challenge of this interface operation beyond their ability and thus lowered their interest. It is proposed to find a simpler way for children to record their speech but if the voice recording system needs be complex then improved training methods will be required. For example, a simplified interface with basic recording functions for training can be offered to allow children to learn how to record a long sentence without extraneous noise being involved. They also need to learn to think ahead, as they should not start the recording until they know what they are going to say. They needed to learn a coherent recording process to make sure the sequence of buttons and voice recording were coordinated.

Finally, however, it should be stressed that the value of using a specific animated cartoon film creation tool in teaching aspects of learning communication skills has been demonstrated. The value of this tool as a classroom aid and for use by individual parents with their children in an out of school situation has also shown encouraging value. As a result this tool will be further developed and used by local schools in their teaching. Particular interest has been shown by a local school for children with special needs and specific interface changes for this group will also need development.

References

All URLs were last reviewed 14/02/2012

Adams, A. M. (2004) *Pedagogical underpinnings of computer-based learning*, Journal of Advanced Nursing, Vol 46, pp. 5-12.

Anderson J. R. (1996) *The architecture of cognition. Mahwah*, NJ: Lawrence Erlbaum Associates.

Andrew W. (1997) *Expressing emotions through cartoons*, School arts, Dec97, 97(4), p22.

Armstrong, N. and Wagner, M. (2003) *Field Guide to Gestures.* Philadelphia: Quirk Books.

Atkins T. (2005) *The cartoon Speaks*, Training, Nov2005, 42(11), p50.

Atwal K., Millwood-Hargrave A., and Sancho J. (2003) *What Children Watch – An analysis of children's programming provision between 1997 – 2001, and children's v*iews. London: BSC and ITC, pp. 71 – 100.

Azar, A. and Sengulec, Q. A. (2011) Computer-*Assisted and Laboratory-Assisted Teaching Methods in Physics Teaching: The Effect on Student Physics Achievement and Attitude towards Physics*, Eurasian J. Phys. Chem. Educ., Jan (Special Issue):pp.43-50.

August Eugene Mansker (2005) *Life is Like a Turtle: You Can't Go Anywhere Unless You Stick Your Neck Out!*, New York: iUniverse, pp.193-194.

Australian Children's Television Foundation (2004) *Kahootz in the Classroom*, [online], *http://www.brokencreekcluster.com/Kahootz/Kahootz%20in%20the%20Classroom.doc*

Basic Skills Agency (2002) *Survey into Young Children's Skills on Entry to Education*,

Wales: Basic Skills Agency.

Basic Skills Agency (2003) *Summary Report of Survey into Young Children's Skills on Entry to Education*, Wales: Basic Skills Agency.

Bazalgette, c. (2009) Impacts of Moving Image Education: A summary of research, Glasgow: Scottish Screen.

Becker, K. (2007) *Digital game-based learning once removed: Teaching teachers*, British Journal of Educational Technology, 38(3), pp. 478-488.

Bell, N. (1991) *Gestalt Imagery: A Critical Factor in Language Comprehension*, Annals of Dyslexia 41, pp. 246-260.

Bell, S. (2010) *2Create a Superstory Case Study, purple press*, [Online]: http://2simpletalk.com/Content/pdfs/purplepress.pdf

Bielli A., Brembti L. and Piccone D. (1997) *European children talk about animated cartoons*, Copenhagen: SOMAR, Youth Marketing.

Bishop, D. V. M. (1997) *Uncommon understanding: Development and disorders of language comprehension in children*, Hove: Psychology Press.

Botting, N. (2006) *Long-term Wellbeing in Children with Developmental Language Impairment*, I CAN Conference Papers.

British Film Institute (BFI) (2000*) Moving Images in the Classroom*, London, London: BFI Education.

British Film Institute (BFI) (2003) *Look again! A teaching guide to using film and television with three- to eleven-year-olds*, London: BFI Education.

British Film Institute (BFI) (2008) *Reframing Literacy*, London: BFI Education.

British Film Institute (BFI), Film Club, Film Education, First Light Movie, UK Film Council and Skillset (2008) *Film: 21st Century Literacy: A strategy for film education across the UK*, [online]:

http://www.21stcenturyliteracy.org.uk/docs/FilmLiteracyHiRes.pdf

Bryan, K. (2008) *Speech, Language and Communication difficulties in juvenile offenders*, In C. Hudson (ed) The Sound and the Silence: Key Perspectives on Speaking and Listening and Skills for Life, Coventry: Quality Improvement Agency.

Buckingham, D. (2005) *the Media Literacy of Children and Young People: A Review of the Research Literature*, London: Ofcom.

Bullock, J.R. (1994) *Helping children value and appreciate nature*, Day Care and Early Education, 21(4), pp. 4-8.

Burton-Wilcock, D. and Shaw, R. (2009) *MediaStage 2: Multi-media, Cross-curricular Activities*, Education Support Pack, [online]: www.immersiveeducation.eu

Burn, A., & Parker, D. (2003) *Analysing media texts*, London: Continuum.

Bynner, J. and Parsons, S. (1997) *It Doesn't Get Any Better: The Impact of Poor Basic Skills on the Lives of 37 Year Olds*, London: Basic Skills Agency.

Calvert, S.L., Strong, B. & Gallagher, L. (2005) *Control as an engagement feature for young children's attention to and learning of computer content*, American Behavioral Scientist, 48, 578-589.

Campbell, A. (1980) *The sense of well-being in America: Patterns and trends*, New York: McGraw-Hill.

Cartwright, S., *Kar2ouche Romans – KS2 Classroom Evaluation*, [online], Teachers Evaluating Educational Multimedia (TEEM), [Online]:http://www.teem.org.uk/

Che Pee, N., Blanchfield, P. and King, E., (2010) *A Computer Game Environment to Encourage Collaborative Learning*, In: 4th European Conference on Games Based Learning. pp. 438-446.

Cherry, K. (2010) How to Become a More Effective Learner: Tips from Psychology to Improve Learning Effectiveness & Efficiency, [online]: http://psychology.about.com/od/educationalpsychology/tp/effective-learning.htm

Clark, C., Osborne, S. & Akerman, R. (2008) *Young people's self-perceptions as readers: An investigation including family*, peer and school influences. London: National Literacy Trust.

Collins, A. (1991) *The role of computer technology in restructuring schools*. Phi Delta Kappan, 73(1), pp. 28-36.

Commission of the European Communities (2009) *Media Literacy*, [online]: http://ec.europa.eu/culture/media/literacy/index_en.htm

Communication Consortium (2008) Explaining speech, language and communication needs (SLCN), [Online]: www.thecommunicationtrust.org.uk

Corcoran, T.B. (1995) *Transforming professional development for teachers: A guide for state policymakers*. Washington, DC: National Governors Association.

Council for the Curriculum, Examinations and Assessment (CCEA) (2006) *Understanding the Foundation Stage*, Belfast: CCEA Multimedia.

Cook, D. A., Levinson, A. J. and Garside, S. (2010) *Time and learning efficiency in Internet-based learning: a systematic review and meta-analysis*, Advances in Health Sciences Education, vol 15, pp.775-770.

Cooper, L (2008) *Kahootz 3: classroom use*, schoolzone, [online] http://www.schoolzone.co.uk/evaluations/classroomuse.asp?evalID=5024

Cox, M. V. (2005) The Pictorial World Of The Child, UK: Cambridge University Press.

Cumbo, L., 2Create a Story – *KS1 Classroom Evaluation*, Teachers Evaluating Educational Multimedia (TEEM), [online]: http://www.teem.org.uk/

Dalacosta, K., Paparrigopoulou, M. K., Palyvos, J. A., & Spyrellis, N. (2009) *Multimedia application with Animated cartoons for teaching science in elementary education,* Computers & Education, 52(4), pp.741-748.

David Newmonic Language Resources (2012) *Language Disorder,* [Online]: http://www.speechlanguage-resources.com/language-disorder.html

Davies, K., Lewis, J., Byatt, J., Purvis, E. and Cole, B. (2004) *An evaluation of the literacy demands of general offending behaviour programmes*, Findings 233, London: Home Office.

Department for Children, Schools and Families (DCSF) (2008) *The Bercow report – A review of services for Children and Young People (0-19) with Speech, Language and Communications Needs*, England, DCSF Publications

Department for Children, Schools and Families (DCSF) (2009) *Independent Review of the Primary Curriculum: Final Report*, Nottingham: DCSF Publications

Department for Education and Employment (DfEE) & Qualifications and Curriculum Authority (QCA) (1999) *English: The National Curriculum for England*, Key Stages 1-4. London: QCA.

Department for Education and Employment (DfEE) & Qualifications and Curriculum Authority (QCA) (2000) *Physical education: A scheme of work for key stages 3 and 4*, London: QCA.

Department for education and skills (DfES) (2004) *Skills for Life – the national strategy for improving adult literacy and numeracy skills: Delivering the vision 2001-2004,* London: DfES.

Department for Education and Skills (DfES) (2005) *Excellence and enjoyment: Social and emotional aspects of learning (guidance),* Nottingham: DfES.

Department for Education and Skills (DfES) (2006) *Primary Framework for literacy*

and mathematics, London: DfES.

Doring, A. (2000) *The Use of Cartoons as a Teaching and Learning Strategy*, Australian Catholic University.

Doublestein, J., Scheuermann, C. & Chen, Y. C. (2007) The Andy Rig 1.4.6 [online] http://www.creativecrash.com/maya/downloads/character-rigs/c/the-andy-rig

Duck, S. (1981) *Toward a research map for the study of relationship breakdown*, In S. Duck & R. Gilmour (Eds.), *Personal relationships 3: Personal relationships in disorder* (pp. 1-29). London: Academic Press.

Ekman, P. (1973) *Cross-cultural studies of facial expression*, In P. Ekman (ed): Darwin and facial expression: A century of research in review. New York: Academic Press.

Entrepreneur (2002) *Animation nation: cartoons draw attention from cell phone users*, [online]: http://findarticles.com/p/articles/mi_m0DTI/is_8_30/ai_96631011.

Eow, Y. L., Ali, W. Z. B. W., Mahmud, R. B., & Baki, R. (2010) *Computer games development and appreciative learning approach in enhancing students' creative perception*, Computers & Education, 54(1), pp.146-161.

Ertzberger, J. (2009) *An exploration of factors affecting teachers' use of video games as instructional tools*, In Proceedings of the 20th international conference of the society of informational technology and teacher education (pp. 1825–1831). Chesapeake, VA: AACE.

Essa, I. A. (1994) *Analysis, Interpretation, and synthesis of facial expressions*, PhD thesis, MIT, Media Laboratory, Cambridge, MA.

Eurybase (2008) *The education system in England, Wales, Northern Ireland 2007/2008*, Brussels: European Commission.

Eurydice at NFER (2011) *Overview of Education Systems in England, Wales and*

Northern Ireland, [Online]: http://www.nfer.ac.uk/nfer/index.cfm?9B1817FF-C29E-AD4D-0F94-7C84904BFE2E

Faggiano, E., and Fasano, M. (2008) *Teachers' perceptions and usage of ICT: An issue for educators to deal with*, accepted as full paper for TSG 22 (New technologies in the teaching and learning of mathematics) - ICME 11, Monterrey, Mexico.

Fast Tracks (2009) *Tracking Through Visual Texts inside Cartoons Knit Wit!*, [online]: http://www.rigby.com.au/fasttracks/pdf/TTVisualTexts.pdf

France, L. (2008) *Lesson' Toon: Conception of Lesson Notes as Cartoon in an E-Learning Platform*, Advanced Learning Technologies. 2008. ICALT '08. Eighth IEEE International Conference on 1-5 July 2008 pp. 597 – 599.

Gargiulo, R. & Kilgo, J. (2005) *Young children with special needs*, (2nd ed.), Clifton Park, NY: Delmar.

Gertner, B.L., Rice, H.L. and Hadley, P.A. (1994) "Influence of communicative competence on peer preferences in a preschool classroom", Journal of Speech and Hearing Research, 37, pp. 913-923.

Good, J. and Robertson, J. (2004) *Computer games authored by children: a multi-perspective evaluation*. In Interaction Design and Children 2004 Conference Proceedings, pp. 123-4, New York: ACM Press.

Hallam, S., Rhamie, J. and Shaw, J. (2006*) Evaluation of the primary behaviour and attendance pilot*, research brief RR717, Nottingham: DfES Publications.

Halliday, E., *MediaStage - KS4 Classroom Evaluation*, [online], Teachers Evaluating Educational Multimedia (TEEM), http://www.teem.org.uk/1925/

Hannafin, R. D., and Savenye, S (1993) *Technology in the classroom: The teacher's new role and resistance to it*, Educational Technology, 33, pp. 26-31.

Hartshorne, M. (2006a) *The cost to the Nation of Children's Poor communication*,

London: I CAN.

Hartshorne, M. (2006b) *Speech, Language and Communication Needs and Literacy Difficulties*, London: I CAN.

Hasselbring, T. S., Smith, L., Glaser, C. W., Barron, L., Risko, V. J., Snyder, C., Rakestraw, J., & Campbell, M. (2000). *Literature review: Technology to support teacher development*. Washington, DC: National Partnership for Excellence and Accountability in Teaching.

Haughton, S.(2010) *2Create a Superstory Review by Simon Haughton*, 2simple Blog, [online]: http://simonhaughton.typepad.com/ict/2010/01/2create-a-superstory-review.html

Haynes, C. (1992) *A Longitudinal Study of Language-Impaired Children from a Residential School*, in P. Fletcher and D. Hall (eds) Specific Speech and Language Disorders in Children, London: Whurr.

Heinz, E. B. (2007) Mental Retardation Research Advances, New York: Nova Biomedical Books

Herczeg, M. (2004) *Experience Design for Computer-Based Learning Systems: Learning with Engagement and Emotions*, In Cantoni, L. & McLoughlin, C. (Eds.) Proceedings of ED-MEDIA 2004. AACE: pp. 275-280.

Hooks, E. (2003) *Acting for Animators: A Complete Guide to Performance Animation*, Greenwood Press, pp.18-20.

I CAN and The Communication Trust (2009) *Report of the Inclusion Development Programme, Speech, Language and Communication Strand Pathfinders,* [Online] www.thecommunicationtrust.org.uk

Jablon, J. R., & Wilkinson, M. (2006) *Using engagement strategies to facilitate children's learning and success*, Young Children, 61(2), pp. 12-16.

James, J. (n.d.) *Computer Assisted Learning/Multimedia, Educational Development Centre,* The Hong Kong Polytechnic University, [online]: http://teaching.polyu.edu.hk/datafiles/P24.ppt

Jasmi, F., Moldovan, L., and Clarke, J. T. R.,(2010) *Hunter disease eClinic: interactive, computer-assisted, problem-based approach to independent learning about a rare genetic disease,* BMC Medical Education vol 10, pp.72.

Jerome, A.C., Fujuki, M., Brinton, B. and James, S.L. (2002) *Self Esteem in Children with Specific Language Impairment*, Journal of Speech, Language, and Hearing Research, Vol.45, pp 700-714

Joint Information Systems Committee (JISC) (2007) *Game-based learning: briefing paper*, London: JISC.

Joy, R., Sage, W. B., and Sage, R. (2000) *Class Talk: Successful Learning through Effective Communication*, Continuum International Publishing Group 2000, pp. 143-159.

Keiling, P. & Lenzo, P. (2010) *A Parenting Guide for Families of Children With Disabilities: Developing Social Skills Towards Independent Living*, Pennsylvania: Dorrance.

Kennedy, G., Petrovic, T., Judd, T., Lawrence, J., Dodds, A., Delbridge, L. and Harris, P. (2000) *The Personal Learning Planner: A software support tool for self directed learning*. In, R. Sims, M. O'Reilly & S. Sawkins (Eds.) Learning to Choose: Choosing to Learn. Proceedings of the 17th Annual ASCILITE Conference (pp. 541-550). Lismore, NSW: Southern Cross University Press.

Ketelhut, D. J. and Schifter, C. C. (2011) *Teachers and game-based learning: Improving understanding of how to increase efficacy of adoption*, Computers & Education, 56(2), pp. 539–546.

Kirriemuir, J., & McFarlane, A. (2004) *Literature review in games and learning*, a report for NESTA Futurelab, [Online]: http://hal.archives-ouvertes.fr/docs/00/19/04/53/PDF/kirriemuir-j-2004-r8.pdf

Klopfer, E., Osterweil, S. & Salen, K. (2009) *Moving learning games forward: Obstacles, opportunities and openness*, An Education Arcade paper, [online]: http://education.mit.edu/papers/MovingLearningGamesForward_EdArcade.pdf

Knapp, M. L. & Judith A. H. (2006) *Nonverbal communication in human interaction (6th edition)*, Thomas Wadsworth.

Koc, M. (2005) *Implications of learning theories for effective technology integration and pre-service teacher training: A critical literature review*, Journal of Turkish Science Education, 29(1), pp.1-18.

Kolb, D., Lublin, S., Spoth, J. and Baker, R. (1971) *Strategic management development: Experiential learning and managerial competencies*, Journal of Management Development, 3(5), pp. 13–24.

Kroncke, K. D. (2010) *Computer-based learning versus practical course in pre-clinical education: Acceptance and knowledge retention*, Medical Teacher, vol 32, pp.408-413, England: Taylor & Francis LTD

Lacey, L. (2007) *Street play: A literature review*, London: Play England.

Lai, C.C. and Kritsonis, W.A. (2006) *The advantages and disadvantages of computer technology in second language acquisition*, Doctoral forum; National journal for publishing and mentoring doctoral student research, 3(1).

Lander S. (2006) *Cartoons on the curriculum*, Times Educational supplement 3/10/2006 Issue 4676, Special section 5, p21.

Law J, Lindsay G, Peacey N, Gascoigne MT, Soloff N, Radford J and Band S. (2000) "Provision for Children with Speech and Language Needs in England and Wales:

Facilitating Communication between Education and Health Services" DfEE research report 239.

Learning Technology Development Unit (LTDU) (2001) *What is Computer Aided Learning (CAL)?* University of Hertfordshire LTDU Learning and Information Services, [Online]: http://www.studynet1.herts.ac.uk/ptl/common/LTDU.nsf/Teaching+Documents/04739C2AEC9B471B8025729F00330361/$FILE/whatiscal.pdf

Lee, W. (2008) Speech, *Language and Communication Needs and Primary School-aged Children*, London: I CAN.

Lee, W. (2008b*) The Communication Cookbook*, London: I CAN.

Long, C. E., Gurka, M. J., & Blackman, J. A. (2008) *Family Stress and Children's Language and Behavior Problems: Results from the National Survey of Children's Health*, Topics in Early Childhood Special Education, PP.148 - 157.

Locke, A., Ginsborg, J. and Peers, I. (2002) *Development and Disadvantage: implications for early years*, IJLCD, Vol: 27, No 1.

Lu. J. F., Li, L. and Sun, G. P. (2010) *A Multimodal Virtual Anatomy E-Learning Tool for Medical Education*, Lecture Notes in Computer Science, Volume 6249, pp.278-287.

Luckock, B., Lefevre, M. and Orr, D with Jones, M., Marchant, R. and Tanner, K. (2006) *Knowledge Review: Teaching Learning and Assessing Communication Skills with Children in Social Work Education*, London: SCIE (Social Care Institute for Excellence).

Madden, M., Chung, P.W.H. and Dawson, C.W. (2009) *Cartoons beyond clipart: a computer tool for storyboarding and storywritting*, Computers & Education, 52

(1), pp. 188-200.

Maestri, G. (2006) *Digital Character Animation 3*, New Riders Press, pp. 248-250.

Mahyuddin, R. and Elias, H. (2010) *The Correlation between Communication and Social Skills among Early Schoolers in Malaysia*, Pertanika J. Soc. Sci. & Hum., Vol. 18, pp 167-174.

Martin, G.N., Carlson, N.R. & Buskist, W. (2009) *Psychology, 4th European edition*, Harlow: Pearson Education, pp. 723-725.

Marton, K., Abramoff, B. and Rosenzweig, S. (2005) *Social cognition and language in children with specific language impairment (SLI)*, Journal of Communication Disorders, Vol .38, pp 143-162.

Maggs, P. (2008) *Kahootz 3.0: Developing software for the classroom*, Teacher, n.189 p.28-31.

Marsh, J. Brooks, G. Hughes, J. Ritchie, L. Roberts, S and Wright, K (2005) *Digital beginnings: Young children's use of popular culture, media and new technologies*, University of Sheffield, [online]: http://www.digitalbeginnings.shef.ac.uk/final-report.htm

Matzen, N. J., & Edmunds, J. S. (2007) *Technology as a catalyst for change: The role of professional development*, Journal of Research on Technology in Education, 39(4),pp 417-430.

McFarlane, A., Sparrowhawk, A. and Heald, Y. (2002) *Report on the Educational Use of Games*, Cambridge: Teachers Evaluating Educational Multimedia (TEEM).

McMullen, K. A. & Wakefield, G. H. (2009) *Relationship Learning Software: Design and Assessment*, in Julie A. Jacko, ed., 'HCI (3)' , Springer, , pp. 631-640.

McPherson, M.A. and Nunes, J.M. (2004) *Developing Innovation in Online Learning: An Action Research Framework*. London: RoutledgeFalmer.

Morgan, L. (2008) I CAN Talk 5: Speech, Language and the Children's Workforce, London: I CAN.

Mwanzia, K. S. (2005) *A Computer Aided Learning Tool :Case of Normalization of Relational Schemata*, MSC report, computer science in Makerere University, [Online]:http://dspace.mak.ac.ug/handle/123456789/611

National Union of Teachers (2007) *Changes to the national strategies for literacy, Including phonics and numeracy*. [Online]: http://www.teachers.org.uk/node/6002

Nicotera, A. M. (1993) *Interpersonal Communication in Friend and Mate Relationships*, Albany: State University of New York Press. Pp. 3-5.

Oblinger, D. (2004) *The Next Generation of Educational Engagement*, Journal of Interactive Media in Education, 2004 (8).

Office of Communications (Ofcom) (2008) *Media Literacy Audit: Report on UK children's media literacy*, London: Ofcom.

Office for Standards in Education (Ofsted) (2007) *The Foundation Stage: a survey of 144 settings*, London: Ofsted

Ostrom, R. (2004) *Active learning strategies for using cartoons and internet research assignment in social studies courses*, Social Studies Review, spring 2004.

Owen, M. (2003) *MediaStage:A Futurelab prototype research report*, www.futurelab.org.uk

Papastergiou, M., (2009) *Digital Game-Based Learning in high school Computer Science education: Impact on educational effectiveness and student motivation*. Computers & Education, 52(1), pp. 1-12.

Parker, D. and Sefton-Green, J. (2000) *Edit-Play: How children use edutainment software to tell stories*, London: BFI

Penman, R. and Turnbull, S. (2007) *Media literacy concepts research and regulatory*

issues, Australian Communication and Media Authority, Australian Government.

Philippe, R. (1980) *Political graphics: Art as a weapon*. New York: Abbeville.

Pivec, M. (2007) *Editorial: Play and learn: potentials of game-based learning*, British Journal of Educational Technology, 38(3), pp. 387–393.

Play Scotland (2006) Play *Scotland 2006 Annual Review*, Scotland: Capscan

Play Scotland (2007) *Play Scotland 2007 Annual Review*, Scotland: Capscan.

Prensky, M. (2003) *Digital game-based learning: Exploring the digital generation*. Washington, D.C.: Educational Technology, U.S. Department of Education.

Qualifications and Curriculum Authority (QCA) (2001a) *Citizenship at key stage 3: Unit 18: Developing your school grounds*, London: QCA.

Qualifications and Curriculum Authority (QCA) (2008) *Every Child Matters at the Heart of the Curriculum*, London: QCA.

Realdon, o., Zurloni, V., Confalonieri, L., Mortillaro, m. & Mantovani,F. (2006). Chapter 14: Learning Communication Skills through Computer-based Interactive Simulations. In G. Riva, M.T. Anguera, B.K. Wiederhold and F. Mantovani (Eds.) From Communication to Presence: Cognition, Emotions and Culture towards the Ultimate Communicative Experience, Festschrift in honor of Luigi Anolli IOS Press, Amsterdam, pp. 281 – 303.

Reid, M., Burn, A. and Parker, D. (2002) *Evaluation Report of the BECTA Digital Video Pilot Project* , London: BECTA (British Educational Communications & Technology Agency)

Rice, M. L., Sell, M. A., & Hadley, P. A. (1991) "Social interactions of speech- and language-impaired children", Journal of Speech, Language, and Hearing Research, 34, pp. 1299-1307.

Roesky H. W. & Kennepohl D. (2008) *Drawing Attention with Chemistry Cartoons*,

Journal of Chemical Education, 85(10), October 2008.

Roschelle, J. M., Pea, R. D., Hoadley, C. M., Gordin, D. N., & Means, B. M. (2000) *Changing how and what children learn in school with computer-based technology*. Children and Computer Technology, 10(2), pp. 76–101.

Royal College of Speech and Language Therapists (2010) *Engaging for their futures and our society, improving the life chances of children with speech, language and communication needs*, a report from their Children's Communication Coalition, London: RCSLT.

Ruben, R.J. (2000) *Redefining the Survival of the Fittest: Communication Disorders in the 21st Century*, Laryngoscope, Vol. 110, pp 241-245.

Rule A. C. & Auge J. (2005) *Using humorous cartoons to teach mineral and rock concepts in sixth grade science class*, Journal of Geoscience Education Nov2005, 53(5), pp.548-558.

Rutherford, F. J. and Ahlgren, A. (1990) Science for All Americans, New York: Oxford University Press

Rutter, M., Mawhood, L. and Howlin, P. (1992) *Language Delay and Social Development. In P. Fletcher and D. Hall (Eds.)*, Specific Speech and Language Disorders in Children, London: Whurr.

Russell, M., Bebell, D., O'Dwyer, L. & O'Connor, K. (2003) *Examining teacher technology use: implications for preservice and inservice teacher preparation*, Journal of Teacher Education, 54(4), pp. 297–310.

Sage, R. (2000) *Inclusive Practice: A Project to Teach Communication Skills*, International Special Education Congress 2000.

Sage, R. (2006) *The handbook of social, emotional and behavioural difficulties:* Chapter 13 - *The communication Opportunity Group Scheme (COGS): teaching*

pupils to communicate, think and act appropriately, London: Continuum. pp. 112-124.

Sandford, R. (2006) *Teaching with Games: COTS games in the classroom*, JISC Innovating e-Learning 2006: Transforming Learning Experiences online conference, [Online]: http://www.online-conference.net/jisc/content/Sandford%20-%20teaching%20with%20games.pdf.

Schramm, W., Lyle,J. and Parker, E.B. (1961) Television in the lives of our children . Stanford, CA: Stanford University Press, pp.24-37.

Scottish Screen (2006) *Moving Image Education and a Curriculum for Excellence*, Glasgow: Scottish Screen.

Scottish Screen (2009) *Moving Image Education in Scotland*, Glasgow: Scottish Screen.

Screen West Midlands (2007) *Switching On To Media Literacy: a media literacy strategy for the West Midlands*, Birmingham: Screen West Midlands.

Shannon, J. D. (1990) *Small-group interactive computer-assisted teaching*, Med Educ. 1990 Mar;24(2):148-50.

Sharma, A (2009) *Moving image education in Wales: the impact of Ffilmschool 2, Film Agency for Wales*, Cardiff: Film Agency for Wales

Special Educational Needs and Disability Tribunal (SENDIST) (2007) *Annual Report 2005/2006*, [Online] http://www.sendist.gov.uk/Publications/annualreports.htm

Sprague, D. (2004) *Technology and teacher education: are we talking to ourselves*. Contemporary Issues in Technology and Teacher Education, 3(4), pp. 353–361.

Squire, K. D. (2005) *Changing the Game: What Happens When Video Games Enter the Classroom?* Innovate - Journal of Online Education, 1(6)

Strommen, E., F., & Lincoln, B. (1992) *Constructivism, Technology, and The Future of Classroom Learning*, Children's Television Workshop, Education and urban society, 24(4), pp. 466-476.

Stothard, S.E., Snowling, M.J., Bishop, D.V.M., Chipchase, B.B. and Kaplan, C.A. (1998) *Language Impaired Pre-Schoolers: A follow up into adolescence*, Journal of Speech, Language, and Hearing Research Vol.41, pp.407-418.

`,k. Schumer, G. and Alexander, K (2008) *Ideas for the animated short: finding and building stories, Focal presss, pp. 224 – 226.*

Susi, T., Johannesson, M., Backlund, P. (2007) *Serious Games: An Overview, School of Humanities and Informatics*, University of Skovode, Sweden, Technical Report HS-IKI-TR-07-001

Teacher Training Agency (TTA) (1999) *National Special Educational Needs Specialist Standards*, London: Teacher Training Agency.

The Communication Trust (2008) *The Speech, Language and Communication Framework (SLCF)*, [Online] www.thecommunicationtrust.org.uk

The Communication Trust (2010) A collection of case studies highlighting effective practice in speech, language and communication, [Online] www.thecommunicationtrust.org.uk

The Foundation for People with Learning Disabilities (FPLD) (2000) *Learning Disabilities - The Fundamental Facts*, London: The Mental Health Foundation.

Thomas, P. (2006) *kar2ouche case study*, [Online]:http://www.immersiveeducation.eu/pdf/products/K2CaseStudy-Stbartholomew.pdf

Trask, R.L. (1999) *Key Concepts in Language and Linguistics*, New York: Routledge.

Ulicsak, M. and Wright, M. (2010) *Games in education: serious games*, Bristol:

Futurelab.

Van Eck, R. (2006). *Digital Game-Based Learning: It's Not Just the Digital Natives Who Are Restless*, Educause Review, 41(2), pp. 16-30.

Wangpipatwong, T. and Chittrakarn, P. (2009) *The Design of Active Learning Environment with the Integration of 3D animation*, Proceedings of the 17th International Conference on Computers in Education, Hong Kong: Asia-Pacific Society for Computers in Education.

Wechselberger, U. (2009): *Teaching Me Softly: Experiences and Reflections on Informal Educational Game Design*, in Transactions on Edutainment II, Lecture Notes in Computer Science, vol 5660, pp. 90–104.

Weiner I, Fritisch R. E. and Rosen B. (2002) Social *Skills Training for the 21st Century*, Academic Exchange Quarterly, summer 2002, p96.

Welsh Assembly Government (WAG) consultation document (2003) The Learning Country: Foundation Phase 3-7 year, Cardiff: WAG.

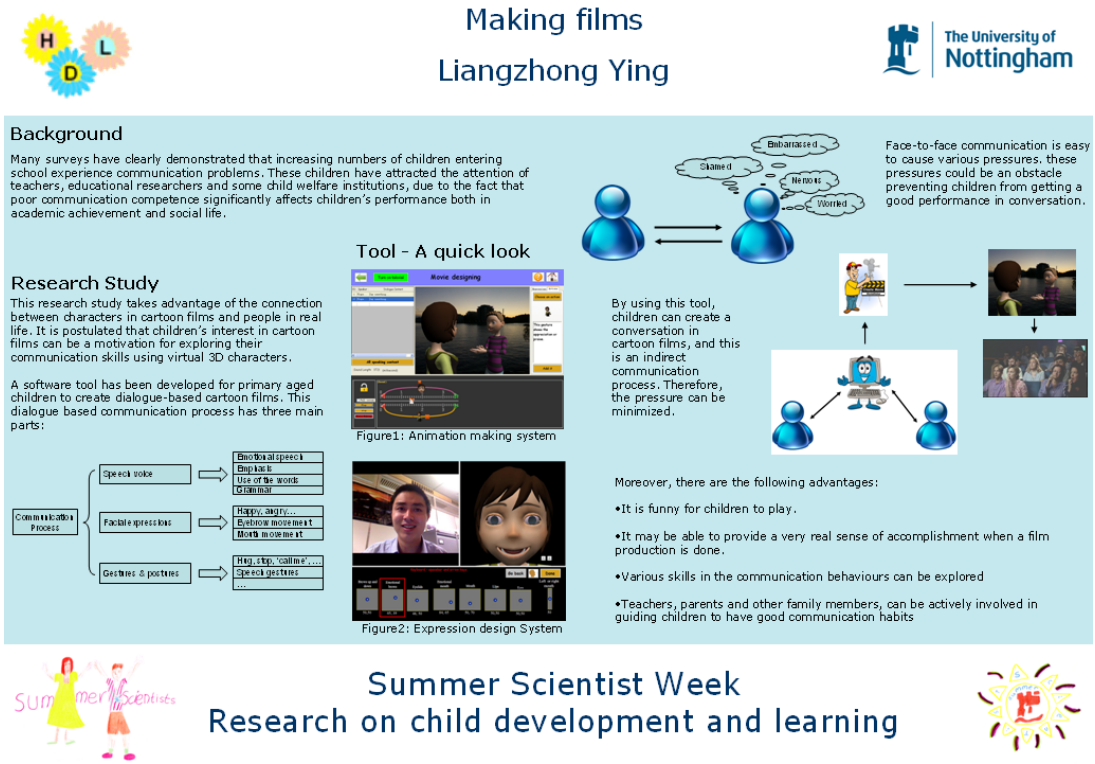
Willis, J. (2008) Brain-based teaching strategies for improving students' memory, learning, and test-taking success.(Review of Research). Childhood Education, 83(5), 31-316.

Young, A.R., Beitchman, J.H., Johnson, C., Douglas, L., Atkinson, L., Escobar, M. and Wilson, B. (2002) *Young Adult Academic Outcomes in a Longitudinal Sample of Early Identified Language Impaired and Control Children*, Journal of Child Psychology and Psychiatry, Vol. 43, pp 635–64.

Yusuf, M. O. and Afolabi, A. O. (2010) *Effects of Computer Assisted Instruction* (*CAI) on Secondary School Students' Performance in Biology*, The Turkish Online Journal of Educational Technology, 9(1), pp.62-69.

APPENDICES

A.1. A poster for Summer Scientist Week



A.2. Questionnaire

Part one: Your child and communication skills

1. How old is your child?

   4 5 6 7 8 9 10 11 12 13

2. Is your child a: boy ☐ girl ☐

3. Is English your child's first language? Yes ☐ No ☐

4. What do you think of your child's general communication skills?

   ☐ Communication difficulties
   ☐ Not good
   ☐ Normal
   ☐ Good
   ☐ Excellent

5. To whom do you think your child expresses their feeling? (Choose as many as apply)

   ☐ My child is to happy to express his/her feelings with anyone
   ☐ My child expresses emotions only when he/she talks with us
   ☐ Others_____

6. Does your child have enough communication opportunities at home?

   Yes ☐ No ☐ Not sure ☐

7. Does your child have enough communication opportunities at school?

   Yes ☐ No ☐ Not sure ☐

8. Would you like to help your child to learn better communication skills yourself?

   Yes ☐ No ☐ Yes, but I don't have time ☐

Part two: Observation of using the software tool

9. How many facial expressions did your child act?

Less than 3 ☐ 4 – 6 ☐ 7- 9 ☐ 10 or more ☐

10. Did your child confidently use these gestures in the tool?

Yes ☐ No ☐ Other_____

11. Was your child happy to discuss with you when he/she made a choice?

Yes ☐ No ☐ Sometime ☐

12. Did your child follow the instructions from the in-built audio tutorial?

Yes ☐ No ☐ Some parts ☐

13. How many films have been designed by your child?

1 ☐ 2 ☐ 3 ☐ 4 ☐ More than 5☐

14. How long did you child spend on making the first film?

Less than 15min ☐ 15 - 30min ☐ 30 - 45min ☐ more than 45 mins ☐

15. How long did your child spend on making the second and later films?

☐ Less than 10min
☐ 10 - 20min
☐ 20 - 30min
☐ More than 30min
☐ They only made one film

16.Which parts of the tool did your child focus on?

☐ Voice recording
☐ Facial Expression design
☐ Using gestures and expressions to make the animation

17. Which parts of the tool are difficult for your child to use?

☐ Voice recording
☐ Facial Expression design
☐ Using gestures and expressions to make the animation

Part three: Parents comments

18. Did you give any suggestions to help your child express his/her feelings?

Yes ☐ No ☐

19. Do you think the tool may help you identify some communication problems with your child?

Yes ☐ No ☐ Not sure ☐

20. Have you found any opportunities to help your child learn communication when he/she was using the tool?

Never ☐ A few ☐ Many ☐ other comments_____

21. How long would you allow your child to use the tool at any time?

Less than 30mins ☐ 45mins ☐ 1hour ☐

more than 1hour ☐ Whatever time my child likes ☐ Not Sure ☐

22.Other comments

Date: ____ / ____ / 2010

Thank you for your help.